THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 23 NEW YORK, DECEMBER, 1925 No. 12

Metal Spinning

A Description of the Equipment and Tools Required

Written for The Metal Industry by WILLIAM MASON, Metal Spinner

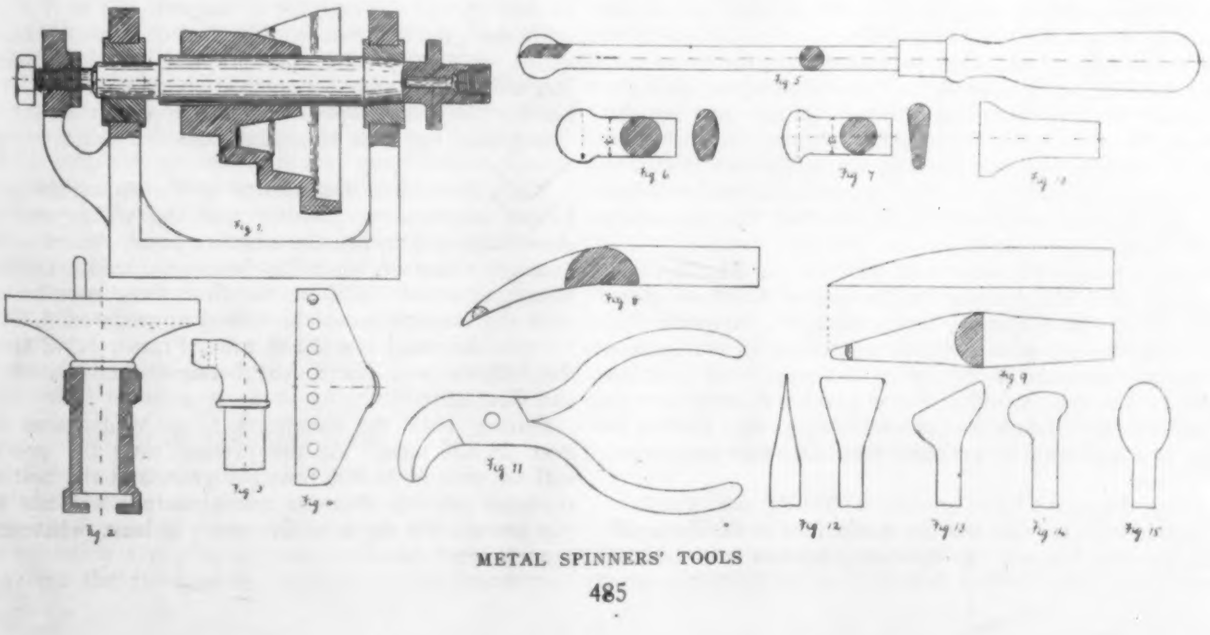
Metal-spinning is the art of shaping a quickly rotating circular piece of sheet metal. Sheet metal, being ductile, can be shaped by bending, hammering, embossing, etc. It has to run at a fairly high speed, and should not be back-geared. The possessor of a wood-turner's lathe has within his reach a tool which, with an outlay of very little money, will enable him to make a variety of sheet-metal goods, both useful and ornamental. It will enable any handy wood-turner to expand his scope of work and add both to his pleasure and profit.

A wood-turners lathe is suitable, but it must be strong to resist the pressure; consequently the mandrel should rest in two bearings. The screw on the nose must be coarse and the collar broad. It would be to great advantage if the mandrel were bored and screwed with an inside thread, in which could be fixed a short piece of hardened and tempered steel rod, itself tapped to take a ¼-in. steel rod; the reason for this will be patent later on. The distance of the lathe centre from the bed should be not less than 6 in., and the bed should preferably be made of two well-seasoned beech planks 6 in. by 2½ in. and 2 in. apart; if possible, have two flat bands of iron 2 in. by 5/16 in. screwed on, with the inner edges parallel.

Very good work can, however, be turned out on an ordinary lathe. For heavy work the lathe may be driven by a belt 1 in. or 1¼ in. wide, the pulley having three or four speeds. If driven by power, of course the usual overhead gear, with fast and loose pulleys, is applied. A lathe driven by gut or cord is suitable for small work only. Fig. 1 is a section of the head stock of a spinner's lathe. The tailstock should be long and accurately centered.

As the spinning tools bear on the work with considerable pressure, the tee-rest should be modified (see Figs. 2 to 4). The tee-piece is furnished with a number of ¼ in. holes, ¾ in. from center to center and not more than ⅜ in. from the front edge. A steel peg 3 in. long and tapered half of its length to fit easily in the holes without dropping through, can be shifted from hole to hole, and thus furnishes a movable fulcrum or resting place for the tools.

The tools used, besides the ordinary turning tools, are of two kinds; spinning tools or burnishers, and finishing tools. The first are used for all metals that can be spun,



METAL SPINNERS' TOOLS

the last only for such metals as will stand turning, viz., brass and German silver. Figs. 5 to 10 show a selection of burnishers for work of small and medium size; Fig. 5 showing a complete tool. Tools Figs. 5, 8 and 9 should be from 15 in. to 18 in. long; the other ones will be large enough if 12 in. to 15 in. long. Figs. 8 and 9 may be of ½ in. square section, or ⅝ in. round. All tools should be highly finished on the working surface and then hardened, not tempered, so that the end is nearly glass-hard, while the other part is only moderately hard and not liable to snap. Figs 8 and 9 should be tempered a cherry yellow about 3 in. along from the end.

To preserve the tools, a piece of thick sole-leather 4 in. by 6 in. is nailed on a board with the rough side upwards; on this some putty powder is sprinkled. The tool is wiped free from oil and the end is rubbed to and fro to get a high polish; in a short time grooves will be worked in the leather, each fitting its particular tool. The brighter the tools, the easier and better the work turned out. Fig. 5 and 6 are for general use; Figs. 7, 8, and 9 for staffs, beads, etc., while Fig. 10 is for the smoothing of larger surfaces.

Besides the spinning tools proper, many spinners use a beading tool, Fig. 11. This is shaped like a pair of priers, but the insides, and edges of the jaws are rounded and smoothed so as not to tear the metal.

Brass and German silver can be finished after spinning by turning; the tools used, of 5/16 in square steel, are illustrated in Figs. 12 to 15. The tools are ground down to a thickness of from 1/32 in. to 1/64 in. and the edge left square as at A, Fig. 12. The length of each tool, excluding handle, is 9 in. to 10 in. Other tools, varying with the work, are used by the spinner, and for a power driven lathe the tools are larger.

Graphite Industry in Madagascar

An American Importer's Opinion

Very little was known of Madagascar graphite before the war. Specimens of it had come to America, but it was only in small samples, too small to be of any value in the way of testing it out on any large scale. The war forced its use, and for a time it was not looked upon as anything but a poor substitute for Ceylon. On account of its flaky formation the crucible makers measured it up with the domestic graphite, but a closer contact disproved this. Although the formation is very similar to the domestic the flake is thicker and is more irregular and carries less volume. While its use has not become general, the demand for it is increasing rapidly. Some of the crucible concerns have discontinued the use of Ceylon entirely, when they are able to get the Madagascar graphite.

There are several reasons for this. In the first place the Madagascar comes prepared for use, or in other words, it does not have to be ground. The grinding of Ceylon entails quite an added expense, not only in the way of cost of grinding, but there is a considerable loss in weight. Some grinders figure that it is worth as much as 2c per lb. to grind and prepare Ceylon graphite for the crucible.

Another factor that figures largely in favor of Madagascar is the fact that it cannot be "doctored" the way the Ceylon product can be. Three grades, or rather varieties of graphite coming from Ceylon are used in making crucibles, and they very seldom come from any one mine. It is invariably a blended product, and the character of the blending depends altogether on the honesty of the Ceylon merchant. The unfortunate part of it is that the best graphite expert in the world cannot diagnose the quality with any degree of certainty, and even an analysis will not show some of the important points necessary to know.

There is very little chance of deception in Madagascar. It comes in a flake form, and whatever variance there might be in one shipment from another it is easily discerned by the eye and there is no chance to manipulate the carbon contents as in Ceylon. There is no question whatever but that it will make as good a crucible as can be made from Ceylon, and it would seem that Ceylon is facing a competition in graphite that has never confronted her before.

During the war a large amount of Madagascar graphite was produced, and this was no doubt due to the demands made by the French Government, because the use of graphite was highly essential for making crucibles and it required crucibles to produce munitions of war. When the war ended there were thousands of tons of Madagascar graphite in store, and on account of the slump in the foundry business most of this was thrown on the market at almost any price offered. Even in 1923 the American importer was able to purchase at 750 francs per ton.

This condition did not last long however. Other countries had learned the value of this graphite, and England, France and Germany began to bid for it. The natural consequence was that the price went up and up until now the price stands at anywhere from 3,000 to 3,500 francs per ton. Even at this price there is very little coming along.

Several reasons are given for lax production, the principal ones being lack of labor and limited shipping facilities. According to reports the workmen in Madagascar will not work at mining when they can get anything else to do. Madagascar produces many other commodities and as long as the people can get work from these sufficient to live on they will not work in the graphite mines.

There is only one little narrow-gauge road running to Tamatave and this road has to carry everything produced in that part of the country to seaport. Even if it carried only the graphite that could be sold it would be inadequate, so that even if the graphite could be mined in larger quantity the transportation would hold it back. During the war graphite had the precedence over everything else, but that condition does not exist any longer now.

Notwithstanding the efforts of the American importer to get Madagascar graphite and the willingness of the American user to pay the advance price, America has not had her share of what has been produced. During the first quarter of 1925, or the first three months of this year the exports from the island aggregated 4,292 tons. Of this England got 2,138 tons, France 1,342 tons and the balance was distributed between the United States and Germany.

During 1917 the shipments from Madagascar totaled over 28,000 tons. At the present time the production will not exceed 15,000 tons per year, and the best advice available predicts that the annual output will not exceed this amount for the next five years at least, whatever may happen after that.

Electric Furnace Linings

Some Refractory Problems in the Non-Ferrous Electric Furnace Casting Shop. A Paper Read at the Syracuse Meeting of the American Foundrymen's Association, October 5-9, 1925

By G. F. HUGHES,
Superintendent of Casting, Bridgeport Brass Company, Bridgeport, Conn.

This paper is the result almost wholly of the writer's experience with induction and rocking arc electric furnace melting in the casting shops of the Bridgeport Brass Company. This company was the first to adopt the induction furnace melting as the preferred means of casting brass billets, slabs and tubes for extrusion, rolling, and drawing; and its aim since that time, has been to make its melting 100 per cent electric in a type of furnace in which metal is melted through heat generated in itself by currents induced in all or a portion of the charge.

The first part of this paper deals with yellow brass which to day presents no problem of a serious nature; the refractories on the average work in a satisfactory way. The chances for improvement are to increase the life of furnace linings which now last a sufficient time to make their replacement cost a small percentage of the total cost of melting. Some improvements may also be made in reduction of electrical loses through refinement of design and refractory insulation. The second part discusses briefly the experience with linings in a rocking arc furnace used in melting copper-tin alloys at temperatures which as yet the induction furnace lining has not handled successfully. In the third part is set forth the work which has been done and which remains to be done in order to bring the induction furnace into the field where its use may be universal in non-ferrous melting. It is not necessary to repeat the oft times mentioned reasons why better metal can be produced if melted in a furnace where the heat is generated in the metal itself, where atmosphere in contact with the bath can be controlled and where heat input and temperatures can be readily determined.

In ordinary non-ferrous casting shop practise these are two general types of melting mediums when considering the refractory problem. First, there is the furnace in which the refractory container for the metal is a heat conductor, namely, the ordinary graphite-clay crucible used in the pit fires; or, various externally fired coke, oil or gas furnaces. On the other hand, there is the type of furnace in which the refractory container acts as an insulator, such as the various types electrically heated; also, the reverberatory type of oil or gas fired furnaces.

It is with the electrically-heated furnaces in which the refractory part of the furnace acts as an insulator for the generated heat, that this paper has to deal. The manufacturers of crucibles for coke, oil, and gas furnaces fired externally have spent considerable time and money for the development of a refractory metal container that will meet the necessary requirements in the melting of all types of non-ferrous alloys. Consequently, they are in a better position to present the problems existing in the developing of this type of melting than is a manufacturing concern whose experience for the past eight years has been almost exclusively with electrically-heated furnaces whose refractory metal containers act as an insulator.

TYPES OF FURNACES USED

In melting non-ferrous alloys by means of electrically generated heat there are three types of furnaces most commonly used, namely, the resistor type, the arc type, and the induction type. The experience of the casting department of the Bridgeport Brass Company has been almost entirely confined to the last two types mentioned; although several years ago, a furnace of the resistor type was used for a time. As both of these latter types of furnaces are well known, it is hardly necessary to go into any detailed description concerning the principles and operation of these furnaces in which the refractory part of the furnace acts as a heat insulator as well as the metal container.

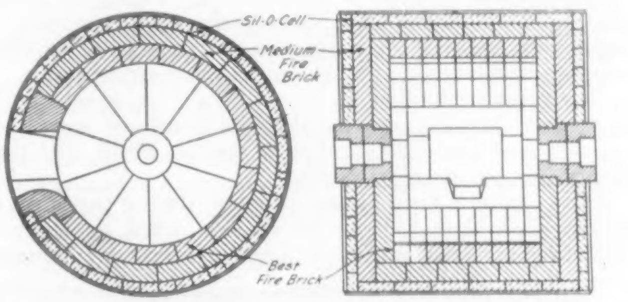


FIG. 1—CROSS SECTION VIEW OF ROCKING ARC FURNACE SHOWING METHOD OF LINING

ROCKING ARC FURNACE

The rocking arc type of furnace used consists of a steel drum-shaped shell with a rectangular shaped vent in the peripheral wall for the purpose of charging and pouring, which opening is covered, when operating, by means of an iron door backed with refractory. Through circular openings in each end of the shell are introduced carbon electrodes. The two electrodes when brought together form the electric arc thereafter supplying the source of heat necessary for melting the charge. Each electrode is held securely by a water-cooled bronze bushing bracketed to the outside of the furnace shell by a refractory brick bushing in the lining wall in such a manner that each electrode is adjustable in a horizontal position either automatically or by hand. The furnace is rocked by means of motor driven gears meshing with a geared band around the circumference of each end of the furnace, the furnace being oscillated thereby through a variable arc. When ready to pour, the furnace may be tilted sufficiently to run the metal through the spouted vent into a ladle; or a tilting around the spout device may be employed for pouring directly into molds. The furnace, as shown in the cross section view was lined by placing asbestos paper next to the shell with subsequent courses of sil-o-cel and fire brick. Within the last year and a half the sil-o-cel course has been eliminated, the lining consisting of only two courses. The furnace lined with refractory is then air dried, heated internally by means of a charcoal fire laid inside the lining and finally, by means of heat generated through the arcing of the electrodes until the temperature attained is high enough to allow starting.

INDUCTION TYPE FURNACE

The induction furnace used was of the Ajax Wyatt type. It consists of a metal shell having a cylindrical top chamber resting on a V-shaped bottom part containing

the channel of molten metal. In the bottom of the V-shaped part of the furnace midway between the V-shaped channel runs a cylindrical opening which contains the copper coil or primary part of the transformer unit which in turn surrounds one leg of the laminated iron core. The channel, or duct, containing the molten metal ring, in which the heat is generated by an induced current to form the secondary part, runs from an opening in the floor of the top chamber down through and following the contour of the V-bottom to re-enter the floor of the top chamber through a hole similar to that first mentioned, thus forming an unbroken molten metal ring from the back to the molten bath in the chamber proper.

The assembled shell is supported as shown on trunnions. In the upper back part of the shell is located a rectangular-shaped opening for charging. Directly opposite in the front part, is located the pouring spout.

The furnace is tilted by means of a "cartwheel" type of turning handle connected through gears and worm to a pulley and chain attached to a sheave, which tilts the furnace to the position desired.

The furnace is lined by first placing asbestos paper next to the shell, then a layer of sil-o-cel brick or similar insulating material against which the refractory cement

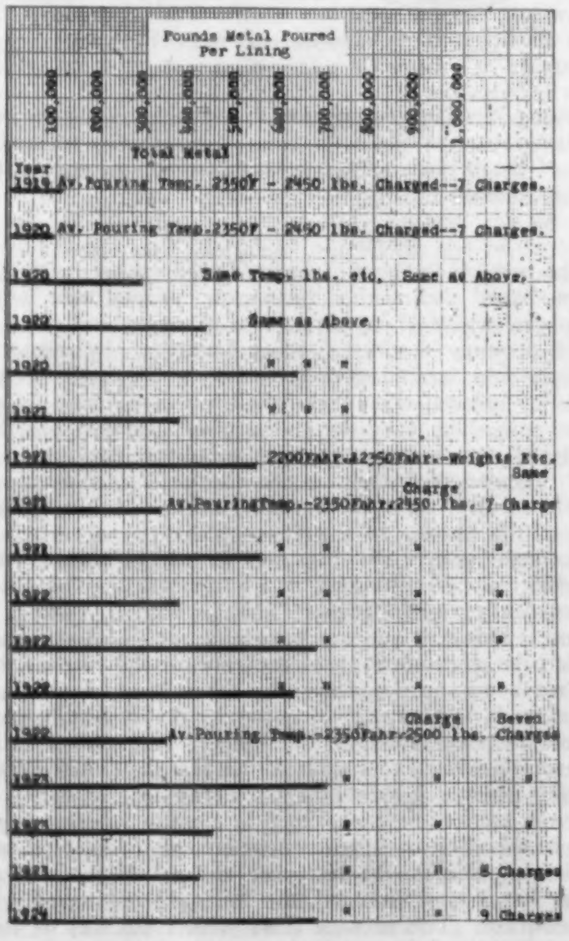


FIG. 2—CHART SHOWING FACTORS OF LIFE OF LINING

is tamped and rammed around prepared forms in successive stages until the V-shaped bottom and cylindrical shells are completely filled with rammed-in refractory. The forms are clamped in place to secure the proper size and shape of channel, forming the secondary part of the circuit, the opening for the transformer coil, and the chamber. This type of furnace is shown assembled in the illustration, an inspection of which will give an idea of the shape and relative size of parts.

REFRACTORY PROBLEMS OF THE ROCKING ARC FURNACE

In the use of the rocking arc type of furnace, it has been our practice to employ a one-ton furnace for melting a charge of metal weighing 2,500 pounds. The cast billets contain a high percentage of copper and a nominal amount of tin, and are poured directly from the shell into the molds. The refractory problem with which we have had to deal, for the most part, has been the failure of the refractory bushing by which the carbon electrode is held in the shell wall. This bushing, if allowed to spall and soften for any length of time will hasten the failure of the surrounding refractory lining with a consequent complete fusion and disintegration before any great amount of metal has been produced. If given immediate attention, by replacing the bushing bricks, softening or spalling in the wall, may be checked. Inasmuch as the above repair work requires interruption of production, it is often allowed to proceed to the extent that a general patching is necessary. It has been our experience that two replacements on refractory bushings and two general patchings of the entire lining have been required before completely scrapping a lining. While not so serious as the above and more easily handled, has been the failure of the door bricks, two sets of which have as a rule been required during the average life of a lining. Fig. 2 is a chart showing the life of some of these linings with the average temperature of pour, weight of pour, and number of pours per day.

PREHEATING IMPORTANT

From the results just previously shown on the curve, it is obvious that we have had our good and bad linings with plenty of opportunity for increasing the length of life on this particular size of furnace in which a copper-rich, copper-tin alloy is melted. It has been our experience that very careful attention is required in the building up of the lining and preheating, before starting with the metal charge. Several days of preheating by means of a charcoal fire before introducing the arc heating are necessary for a successful start. During the past few months, graduated heating between the charcoal fire and the starting of the arc has been carried on by means of an oil torch, starting with a moderate temperature and gradually increasing until ready for arcing the electrodes. Better results seem to have been obtained.

REFRACTORY PROBLEMS OF THE INDUCTION TYPE FURNACE

Concerning refractory linings in the induction type of electric furnace, our experience has been entirely with the Ajax-Wyatt type, although some experimental work has been done on another type of induction furnace. In lining the V-type of induction furnace until recently, the refractory has always been rammed in, starting with a thin asbestos paper laid against the bottom or V-part of the shell against which the sil-o-cel or nonpareil bricks have been laid, the long side of the bricks being laid vertically against the paper.

The insulating bricks are laid in sections around and against which thoroughly mixed refractory lining material is tamped and then rammed down with a final rough finish for the succeeding layer of lining material. With the transformer bushing and duct forms held in place securely by braces, the material is rammed in until the furnace has been completed.

Quite recently it was discovered that the insulating brick used had a fairly high shrinkage value, and, having this property under high temperatures, it was thought that the shrinkage of the insulating brick was a consider-

able factor in causing strain cracks to originate in the rammed lining. Consequently, a "fire backing" with a minimum shrinkage was obtained and substituted. Due to the fact tht it is impossible to observe what really takes place within the furnace lining material, it could not be determined that the substitution of this "fire backing" for insulating brick resulted in any direct improvement, but it was thought to be a safeguard against strain cracks due to shrinkage of backing material and therefore adopted. A cross section view of this lining is shown in Fig. 3.

Various methods of setting, air drying and preheating prior to the introduction of molten metal for starting have been tried. The methods differ for different types of linings and will be so dealt with in the presentation of the problem according to the type of material under discussion. In the following paragraphs will be discussed the use of some different refractory materials and the results obtained.

ALUMINA-SILICA REFRACTORY LININGS

The use of alumina-silica refractory cement containing asbestos fibre was coincident with the introduction of the furnace. In its use in furnaces melting yellow brass both good and bad linings resulted. Averaging the periods of lining life, however, it may be safely stated that an alumina-silica refractory cement fusing about 2600 degrees Fahr. will give fairly satisfactory results on brass, if properly sized and thoroughly mixed in its manufacture. Consistently uniform chemical composition, texture, and size of grain must be maintained as a basis for the preparation of a satisfactory refractory cement. Because of variations in the above properties, a second source of essentially the same type of cement was tried and while the period, over which this cement has been used in furnaces melting yellow brass, has been comparatively short, more consistent lining life seems to have been obtained, chiefly due to the general uniformity of the cement.

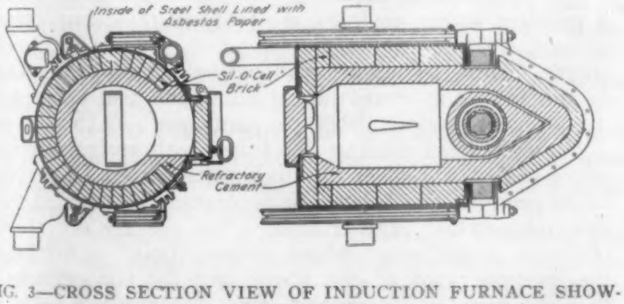


FIG. 3—CROSS SECTION VIEW OF INDUCTION FURNACE SHOWING POSITION OF RAMMED PARTS. RECENTLY FIRE BACKING HAS BEEN SUBSTITUTED IN PLACE OF SIL-O-CEL BRICK

Up to a year ago, one of the problems with which the operator of the induction furnace had been confronted in securing a satisfactory refractory, was the difficulty in obtaining from some refractory cement manufacturers definite specifications covering chemical composition, texture, size of grain, etc., which would form the basis of specifications for use when ordering the cement. There seemed to be a tendency on the part of the manufacturer to study superficially the operators' requirements and then to attach to a product developed for the operator a trade name, by which the material had to be ordered, subsequent lots of which departed from the original in some of the essentials. This condition forced the furnace operator to take up the study of refractories in order that he might protect himself by intelligent purchase of material rather than promiscuous buying by trade name. During the past year, however, there has been a very marked change in the above respect. To the Harbison-Walker Refractories Co. and to Johns-Manville, Inc., must be given a great amount of credit for co-operation in this development work.

The use of the alumina-silica cements has been confined necessarily to furnaces in which yellow brass has been melted because of the comparatively low fusing point. Attempts at melting alloys of the low brass and gilding metal class have been made, using the alumina-silica cements, with adverse results.

Even in the melting of yellow brass mixtures in furnaces using alumina-silica cement as the refractory, it has been found necessary to take precautionary measures to prolong the life of the linings. "Driving" the duct, during operation of the furnace and cleansing the encrusted refractory by means of molten copper, have been measures to which the operator has had to resort. "Driving" consists in forcing a steel bar down each side of the "V" to the point, breaking off the encrusted material to prevent the furnace from ceasing to operate. The addition of molten copper will scour the lining around the metal ring very often so that efficient operation may be continued.

The most familiar reason for causing a furnace to "break down" in operation is the short circuiting of the primary and secondary system by means of a connection of the molten ring with the primary coil. This failure is due, usually, to a crack existing in the refractory through which the molten metal filters until a contact between the molten ring and the primary coil is formed.

The "freezing" or solidifying of the molten ring has been an all too frequent cause of failure and is usually started by a gradual reduction in the area of the metal ring due to encrustation of dirt, zinc oxide, and some fused matter to the point where neglect temporarily allows the metal in the ring to "freeze" or become mushy. However, it has been the experience of electric furnace operators in our plant that an alumina-silica refractory cement with no wide variations from the standard in chemical composition, grain size, and texture, will give very satisfactory results in melting yellow brass alloys.

REFRACTORY CEMENTS FOR HIGH COPPER ALLOYS

Since no consistently satisfactory results have been obtained in melting low brass, gilding metal, copper-tin, and pure copper mixtures in electric induction furnaces using an aluminum-silica cement, previous to our co-operative work, it was decided that refractory cements having higher fusing points must be selected with which to carry on experimental work. Furthermore, it was felt that a cement satisfying the conditions required for use in melting the higher copper alloys mentioned would make more efficient in operation those furnaces melting yellow brass alloy and prolong the life of the latter furnaces considerably.

Coincident with this decision a change in the attitude of the refractory cement manufacturers was noticed. Furthermore, it is worth noting that two of our leading refractory cement manufacturers recommended at this time a type of refractory cement essentially the same in composition. This cement contains as a refractory, a chrome ore fairly low in silica content. The recommendation that a chrome base cement instead of an alumina or magnesia base be used, was made because of the comparative ease in bonding the chrome base cement.

A great amount of time was first spent in the development of the proportions of refractory and bond and in the sizing of the refractory materials to be used. In the case of the first source a satisfactory cement for ramming and bonding seemed to have been obtained and then, later,

difficulty was experienced in ramming and bonding the cement, so that it is only the second source of cement that the balance of this paper has to deal with.

As a conclusion to the preliminary work with one of the manufacturers mentioned above, six cements of varying composition were selected with which to carry on further experimental work to determine which one or more would give satisfactory results. Elaborate tests on shrinkage, expansion, vitrifaction, and fusion have been carried on to the end that one cement has been selected which seems to give the best results. In this work, it must be remembered, the objective toward which all experimental work has been directed, has been to obtain a refractory cement that will function properly at temperatures attendant upon the melting of alloys containing copper, in excess of 80 per cent, combined with zinc; and alloys of tin and copper where the variation is from 1 per cent to 8 per cent tin. Supplementing the above, various cement mixtures have been found during the course of the experimental work which have permitted the operation of furnaces more efficiently and for longer periods before failure. This latter result has opened up to the cement producer a much wider field than formerly held inasmuch as very consistent results have been obtained with various mixtures of chrome base cements on melting alloys composed of copper and zinc as high as 95 per cent copper and 5 per cent zinc. Although some fair results have been obtained in melting phosphor bronze mixtures and phosphorized copper, the runs have not been so consistently satisfactory to warrant the conclusion that the problem has been solved.

Enough data from experiments on shrinkage, expansion, etc., from normal temperature (60 degrees Fahr. up to 2400 degrees Fahr.) have been recorded to permit the conclusion that a cement has been obtained which will give satisfactory results so far as the above properties are concerned. During the period of air drying, preliminary heating before priming, and actual priming, a sufficient number of observations have been obtained to warrant the conclusion that not very much is to be feared in the preliminary treatment before actual melting takes place. Indications seem to point to the fact that it is only after vitrifaction takes place that the cracking trouble develops to the point where actual failures follow.

CONCLUSIONS

The progress of the work to date has brought those involved to the conclusion that the problem must be solved in one of two ways; namely, that a refractory must be used in which vitrifaction will not take place under the working temperatures involved, at least to such an extent that the cross section of the lining affected will crack throughout; or, two different layers of lining material must be used to accomplish the first mentioned result desired. It is quite possible that, before the actual reading of this paper, this end will have been accomplished.

Properties of Brass Rods

Q.—What are the qualities which one usually desires in a brass rod?

A.—1. Free turning. This means a short chip, and the minimum resistance to the cutting edge of the tools, consistent with sufficient strength in the material to meet any demand for which the finished article is designed.

2. Freedom from any foreign matter in the brass, iron, etc.

3. A homogeneous metal, no blow holes, or other internal defects.

4. Freedom from surface defects.

5. Accurate diameters.

6. Straight, clean rods, cut exactly to length as ordered.

7. Few random lengths in shipments of stock sizes.

8. And not the least important item, in this new era of making the manufacturer carry the stock, is prompt shipment.

Every maker of rods in the country produces material which meets all of these requirements some of the time, but not all consistently maintain this high quality.

A slight difference in the turning qualities means increased tool cost and smaller out-put, but this does not look formidable in a day of week test. Any defect in the rod that slows up the operation, or increases the scrap loss, naturally increases the cost of the article to be manufactured.

If these conditions are not too pronounced and continual they are looked upon as a necessary evil, unless their importance is brought home by a comparison with a class of rods that are regularly and consistently free from any defects.

Probably the greatest variations occur in the free turning qualities of the rod. Most screw machine men work on a piece work basis, and are keenly sensitive to any condition which slows up their production. And their approval of any lot of rods stamps them as a high quality product. They seldom concern themselves as to the source of supply, however, and the value of their opinion is limited to the fact that the rods are good or bad for their work.—W. J. Pettis.

Soldering Brass Frames

Q.—We wish to inquire if you can assist us in solving a problem which we think is of considerable importance, namely, welding automobile windshield frames with silver solder. These frames are made with common yellow brass in the following composition: Tin, .83 per cent; lead, .05 per cent; copper, 59.88 per cent; zinc, 39.15 per cent.

We have tried welding this frame with several kinds of silver solder, the silver in which varied from 18 per cent to 40 per cent, the balance being copper and zinc in various proportions. The trouble is that we are not able to obtain a silver solder whose melting point is far below the melting point of the frame and the consequence is that the metal is overheated, thus showing pin-holes on the surface of the frame. These are more pronounced in appearance when buffed and nickel-plated.

A.—Welding or brazing common yellow brass composition copper 59.88 per cent, zinc 39.15 per cent, tin .83 per cent, lead .05 per cent is rather difficult even with low tempered silver solder. The regular cheap brazing spelter is a compound of 60 per cent copper, 40 per cent zinc and your frames are practically made of this material. No hard solder with a lower melting point than that of the best grades of silver solder would have strength enough to hold the parts properly together.

Our suggestion first would be to change your frame mixture to a higher copper content leaving out some of the lead and all of the tin. Second, solder up the pin holes with pure tin after you have polished the parts for plating. Reduce the temperature of the fire to just enough to melt the solder.—W. L. Abate.

Uses for Centrifugal Casting Calculations

A Method for Determining Important Features in the Design of Vertical or Inclined Machines for Production of Centrifugal Castings of Brass, Bronze or Other Metals

Written for The Metal Industry by ROBERT F. WOOD, Assistant Superintendent, Irvington Smelting and Refining Works, Irvington, N. J.

Centrifugal casting is unlike other casting methods by reason of the very different type of equipment used, and consequently in the need of specially designing and operating this equipment so that it will do the required work in a way to get the best results.

It is not the purpose of this article to enter into the details of mechanical construction for the minutiæ of casting operations. Given certain fundamental requirements a competent designer will be able to draw up a satisfactory machine if due attention be paid to strength, convenience of operation, and the nature of the specific work in hand; the rest may be learned from practice or found in the literature upon the subject. A study of the many patents covering casting machines and processes would be of value. L. Cammen has given a good list of these in Appendix No. 2 of "Centrifugal Casting," Transactions of The Am. Soc. of Mech. Engrs., 1922, Vol. 44.

The speed of revolution at which a casting machine is to be run is a vital element in both the design and operation of casting equipment, because the centrifugal force developed varies with the **square** of the speed and affects both the machine and the casting made therein. It is the purpose of this article to point out some important particulars in which this factor should be taken into consideration and determined and to show how to use it.

It is self-evident that a slowly revolving mold will not "pick up" the metal, or if it does so momentarily, the centrifugal force may not be sufficient to retain the fluid metal against the walls of the mold, so that it drops back again, a condition obviously incompatible with good results. On the other hand an excessively high speed has drawbacks equally serious. It involves high stresses in the machine and casting alike, excessively heavy and expensive construction for the machine, and possible bad consequences to the casting, not forgetting the element of danger if a machine is run at speeds beyond those for which its design renders it safe.

The logical course would be to determine what speed of revolution is favorable to the production of a good casting, and then to design the machine to cover a range of speeds at about that figure.

Before seeking to determine favorable speeds it may be well to examine the conditions and find out what factors can be kept constant for all diameters of castings, in order to make out, if possible, a schedule of speeds that may give more or less uniform physical conditions for castings of widely different diameters.

Consider first the circumferential velocity, which in feet per second we shall call v. If r is the radius of the casting in feet and n the revolutions per second, we have $v = 2\pi rn$. Therefore the circumferential velocity will vary directly with the radius and with the speed of revolution, and if this velocity is to be kept constant for all diameters the speed of revolution must vary inversely as the radius. In other words, if the radius were multiplied by, for instance, 1.5, the revolutions per second would have to be divided by 1.5 in order to maintain the same circumferential velocity.

Consider second the tensile stress in the wall of the casting,—a stress that develops as soon as the casting has begun to shrink away from the supporting walls of the mold. This stress is proportional to the centrifugal force, and follows the same laws as indicated below.

Consider third the centrifugal force, $C = mv^2/r$, the mass of a particle being m. Since $v = 2\pi rn$, we have $C = 4m\pi^2 rn^2$, hence the centrifugal force and the tensile stress in the casting vary directly with the radius and directly with the square of the revolutions per second. Therefore if the centrifugal force and the tensile stress are to be kept constant for all diameters of castings, the speed of revolution must vary inversely as the square root of the radius. In other words, if the radius were multiplied by, for instance, 1.5, the revolutions per second would have to be divided by $\sqrt{1.5}$ in order to maintain the same centrifugal force and tensile stress.

It is thus apparent that it will be impossible to maintain all three of the above factors at constant figures for all diameters of castings, but by disregarding the circumferential velocity it would be easy, by adjusting the speeds, to keep the centrifugal force and the tensile stress both at constant values.

Probably every foundry would determine for itself how to gauge its speeds of revolution for castings of different diameters, and having done so, since the results are found by experiment and the rule is empirical, might consider such results as their own particular property. However, a formula for speeds of revolution has been published by L. Cammen (paragraph 73 in Appendix No. 3 of the reference already cited), and this may be taken as, in general, a reliable means to ascertain favorable speeds for castings of various diameters.

This formula, $N = 1675/\sqrt{R}$, in which N is the revolutions per minute and R the radius of the casting in inches, is based on maintaining the centrifugal force at 75 lbs. per lb. of metal, regardless of the diameter of the casting, and since this applies to metal of the specific gravity of steel it will be very nearly the same for brass or bronze.

Tabulating representative diameters, the corresponding favorable speeds would be as follows:

TABLE I

Favorable Speeds of Revolution for Various Diameters

Diameter	Radius, R	N	n
4 inches	2	1183 r.p.m.	19.7 r.p.s.
6 "	3	967 "	16.1 "
8 "	4	837 "	13.9 "
10 "	5	748 "	12.4 "
12 "	6	684 "	11.4 "
15 "	7.5	611 "	10.2 "
18 "	9	558 "	9.3 "

In this paper all selections of favorable speeds will be premised upon the above table, deduced from the Cammen formula.

If now it be desired to build a machine which is to produce castings of for instance from 4 to 8 inches in diameter, the construction of the machine should admit of the use of speeds varying from 837 r.p.m. to 1183 r.p.m., as shown by the table. Conversely, by determining the widest range of speeds mechanically feasible in one machine, Table 1 will show the range of diameters that such a machine could handle, remembering always that appropriate arrangements must also be provided for molds of various diameters.

Table 1 will be found useful not only in determining speeds for customary types of horizontal casting machines, but its use may be extended with advantage to the de-

termination also of certain necessary specifications for the design and construction of machines operating with vertical or inclined axis, such as would be required, for instance, in carrying out the Taylor & Wailes or the Huth processes (British Patents 3819, year 1878, and 21,213, year 1894, both registered in U. S. Patent Office) for the production of castings having parabaloidal bores.

In a previous paper (Centrifugal Casting Calculations, in The Metal Industry, May, 1925, pp. 186-189; see also July, 1925, p. 278), there were derived and illustrated certain formulae applying to such processes, by which the shape of centrifugal castings can be accurately determined when made with the mold in the vertical or in an inclined position, and also certain formulæ by which the requisite (but not necessarily the most favorable) speeds can be ascertained, to produce such castings.

The illustrative example there used was a casting 8 ft. long and 8 in. O.D., with a wall thickness of 1 in. at the upper end and 2 in. at the lower, that is, 6 in. I.D. at the upper end and 4 in. I.D. at the lower. It was shown that the bore of this casting was the frustum of a paraboloid of revolution generated by the parabola $y = 230x^2$, and that this same parabola and hence the same shaped bore would be produced in the casting regardless of whether the mold was vertical or inclined, provided the speed was adjusted to suit the inclination.

It was shown that the speed required to produce this particular parabola and hence this particular casting, would be 1160 r.p.m. if the mold were vertical, or 930 r.p.m. if the mold were inclined at 40° to the horizontal. For every different inclination to the horizontal there would be a corresponding speed in revolutions, which in every case would produce the same shaped casting. It is here our purpose to show how to determine what angle of inclination it would be best to select.

It was shown that the speed relation is $n = 1.276 \sqrt{M \sin \beta}$, in which n is the revolutions per second, M the coefficient of x^2 in the equation of the parabola (explained in previous article), and β the angle of inclination to the horizontal. It was shown also that the value of M for any given casting can be obtained from the dimensions of the bore of the casting itself, and that the inter-relation between the angle of inclination, β, and the speed of rotation, n, can be adjusted then as desired.

Right here a schedule of favorable speeds, like Table 1, is of great utility in drawing up the fundamental specifications for machine design. From the dimensions of the casting in question we may say that the mean diameter of the casting is about 7 in.; its O.D. is 8 in. and its smallest I.D. is 4 in. Naturally the ideal speed for one part of the casting may be too low or too high for some other part, hence any selection of speed from Table 1 will have to be more or less of a compromise. However, if 6 in. be taken, the table indicates a favorable speed of 967 r.p.m. or 16.1 r.p.s., therefore we shall take $n = 16.1$. For this casting it was shown in the previous article that $M = 230$. Putting these value for n and M into $n = 1.276 \sqrt{M \sin \beta}$ we have $16.1 = 1.276 \sqrt{230 \sin \beta}$, and solving for $\sin \beta$ we find $\sin \beta = 0.69$, whence the angle β is about 43 or 44 degrees. Therefore an angle of inclination of about this amount would give satisfactory speeds for castings of approximately these proportions, and the machine should be designed so as to include this inclination and the selected speed within its range of operation.

Suppose, however, that the required casting had been long and slender, say 13 ft. long, 6 in. O. D., 1 in. I. D. at the upper end, and 3.5 in.I.D. at the lower end By the methods given in the previous article, $D = 13$, $x_2 = 2.5/12 = 0.208$, $x_1 = 1.75/12 = 0.146$; then $M = 13/(0.208^2 - 0.146^2) = 590$, and the expression for the bore of this casting is $y = 590 x^2$. Interpolating in Table 1 for a diameter of 5 in., the corresponding favorable speed is seen to be about 1050 r.p.m. or 17.5 r.p.s., hence we may take $n = 17.5$. From $n = 1.276 \sqrt{M \sin \beta}$ we have $17.5 = 1.276 \sqrt{590 \sin \beta}$; solving as before we have $\sin \beta = 0.318$, whence the angle β is about 18°, and the machine should be designed so as to include this inclination and the selected speed within its range.

If the machine were constructed vertically and expected to turn out such a casting, the speeds would be excessive. This can be seen from the same equation, $n = 1.276 \sqrt{M \sin \beta}$, for with $\beta = 90°$ we would have $\sin \beta = 1$ and $n = 1.276 \sqrt{590 \times 1} = 31$ r.p.s. or 1680 r.p.m. High inclinations, as 80° or 60°, would approach more or less to this high speed, in accordance with the relations shown in the equation.

It follows therefore that long slender castings with a larger I.D. at one end than at the other will usually best be made at comparatively low inclinations in order to avoid excessive speeds. Conversely, short thick castings such for instance as projectiles, for which the speeds would come low in any case, would best be made at high inclinations or even vertically, so as to take avdantage of the higher speed that accompanies high inclinations, for the equation shows that the maximum possible speed for any given bore will be attained in the vertical position.

Having constructed a vertical or an inclined machine, its operation may be controlled accurately and easily by applying the calculations described in THE METAL INDUSTRY, May, 1925. (See also July, 1925, p. 298).

As far as the equation $n = 1.276 \sqrt{M \sin \beta}$ itself is concerned, it is evident that the angle β might be selected at a very low value, and still the equation would yield a corresponding theoretical figure for the speed n, but practically this might be so low a speed as to be out of reason altogether. For instance, take the casting mentioned above, whose bore is $y = 230 x^2$. At a 2° inclination, or $\beta = 2°$, we would have $n = 1.276 \sqrt{230 \sin 2°} = 3.6$ r.p.s.: this is 216 r.p.m. which is so much lower than the favorable values in Table 1 that good results could not be expected at all.

There is at least one other application of interest in this connection. Centrifugally cast tubes with cylindrical bore are made usually in a machine having its axis horizontal, but if short pieces are desired it might be found more convenient to use a vertical machine and pour the metal in from the top. Made in this way the bore could not be perfectly cylindrical, but as has been pointed out in the Taylor & Wailes patent, it will be nearly cylindrical if the speed of rotation is high.

In order to design a machine for this class of work it would be useful to know just the amount of deviation from cylindrical form that would result in any given case, so as to design the machine for speeds that would give close to a cylinder and yet not involve any speed higher than reasonably necessary.

Let us assume that castings are required to be 11 in. long and 10 in. in diameter, with a permissible deviation of 0.2 in. from cylindrical. That is, with 10 in. diam. bore at the upper end, the lower end could be 9.8 in. diam.

The upper and lower radii then are 5 in. and 4.9 in. respectively, and by the methods described in the previous article, $D = 11/12 = 0.9167$, $x_2 = 5/12 = 0.4167$, $x_1 = 4.9/12 = 0.4083$, $M = 0.9167/(0.4167^2 - 0.4083^2) = 132$; whence the expression for this bore is $y = 132 x^2$.

From $n = 1.276 \sqrt{M \sin \beta}$, with $\beta = 90°$ we then have $n = 1.276 \sqrt{132 \times 1} = 14.6$ r.p.s., or 876 r.p.m. Therefore if this speed were used the deviation from cylindrical would be only 0.2 in., and if it were desired to reduce the deviation still lower the machine could be designed for a still higher speed.

Tests for Molding Sand

A Resume of the Tentatively Adopted Methods of Tests Developed by the Joint Committee on Molding Sand Research of the American Foundrymen's Association. Conclusion.*

PROCEDURE FOR MOLDING SANDS CONTAINING NO CLAY OR BONDING SUBSTANCE

1. One hundred grams of sand dried for at least one hour at a temperature which shall not be lower that 105° C., nor higher than 110° C., are transferred to the first of a series of sieves, U. S. Bureau of Standards Numbers 6, 12, 20, 40, 70, 100, 140, 200, and 270; and placed in a Ro-tap testing sieve shaker, or other machine, the use of which may yield identical results. This machine is run for 30 minutes, and the amount of sand remaining on each sieve is weighed and expressed in percentage. The portion passing the No. 270 sieve is known as No. 270 minus.

PROCEDURE FOR MOLDING SANDS CONTAINING CLAY OR BONDING SUBSTANCE

2. Fifty grams[1] of molding sand, dried for at least one hour at a temperature which shall not be lower than 105° C. nor higher than 110° C., are put into a one-quart milk bottle or preserving jar, smooth on the inside with no sharp shoulders in the neck, to permit the sand to be easily removed with a small stream of water. Four hundred seventy-five cubic centimeters of water and 25 cubic centimeters of a standard solution of sodium hydroxide (made by dissolving 10 grams of sodium hydroxide in 1000 cubic centimeters of water) are added, and the bottle or jar is covered and securely sealed.

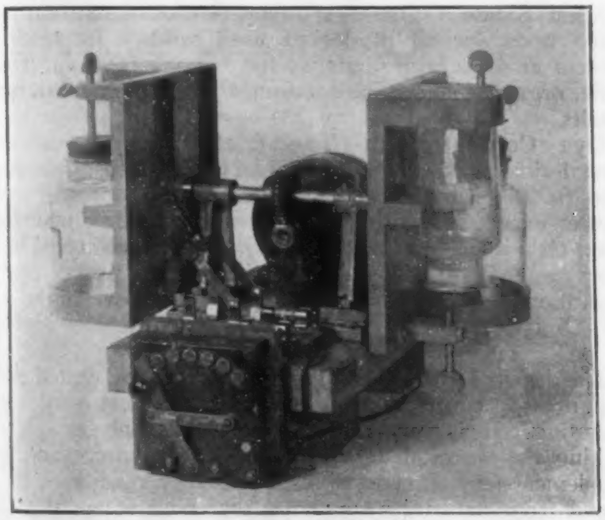


FIG. 1—SAND WASHING APPARATUS FOR USE IN CONNECTION WITH FINENESS TEST OF MOLDING SAND

In using a preserving jar, instead of the usual rubber ring, a rubber disc is employed, which fits into the inside of the glass cover. The receptacle is then placed in a shaking machine, making about 60 revolutions per minute, in such a manner as to allow it to be up-ended at each revolution. At the end of one hour the receptacle is removed, the cover is unsealed, and the sand adhering to the cover is washed into the receptacle. The receptacle is then filled with water, permitting the stream to stir up the contents, and allowed to stand for ten minutes, when by means of a siphon exending to within 2.5 centimeters (approximately 1 inch) of the bottom of the receptacle, the water is siphoned off. More water is added, filling the receptacle, and at the end of 10 minutes siphoned off. Water is added again, and at the end of 5 minutes siphoned off. The process of 5 minutes standing and siphoning is repeated until the water remains clear at the end of the 5-minute period. By this means the clay substance is separated from the grain, and may be collected in suitable containers and recovered by the addition of acid to neutralize the sodium hydroxide.[2]

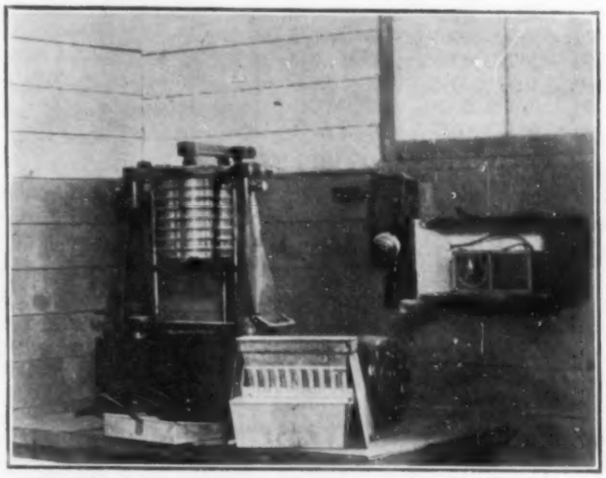


FIG. 2—ROTAP SAND SCREENS AND TIME SWITCH SET UP AS USED IN CONNECTION WITH FINENESS TEST OF MOLDING SAND

3. The grain remaining in the bottle or jar is washed on to a filter-paper, in a 9-centimeter Buchner's funnel, is drained by means of suction, then wet with alcohol, and transferred, together with the filter-paper, to a large glass, and dried for one-half hour at a temperature which shall not be lower than 105° C., nor higher than 110° C. The dried grain is weighed,[3] and the difference between its weight and that of the original 50-gram sample is ascertained to determine the clay substance.

4. The grain is then placed on the first of a series of sieves, U. S. Bureau of Standards Numbers 6, 12, 20, 40, 70, 100, 140, 200 and 270. These sieves are placed in a Ro-tap testing sieve shaker, or other machine, the use of which may yield identical results. This machine is run for 15 minutes, and the amount remaining on each sieve is weighed and expressed in percentage. The portion passing the No. 270 sieve is known as No. 270 minus.

5. Series of Sieves, U. S. Bureau of Standards.[4]

6. The fineness test may be graphically expressed by plotting sieve numbers as abscissa against the grain remaining on each sieve, as the per cent of 50 grains.

*Parts 1 and 2 were published in THE METAL INDUSTRY for March and July, 1925.

[1] Since a 100-gram sample involves so many siphonings as to make the test prolonged, a 50-gram sample is more convenient to use.

[2] For practically all known American molding sands this treatment is satisfactory. There are some foreign sands that are alkaline, and require an acid treatment, in which case tannic acid may be used.

[3] The filter-paper may be disposed of, after drying, by burning, as it lies on top of the sand sample.

[4] The Bureau of Standards notified the Joint Committee in April, 1924, of its revisions in standard specifications for sieves. The principal revisions permit considerably larger tolerances for wire diameter than had previously been called for. More latitude has been given in the revisions, for tolerances in average opening, than were previously prescribed. The revisions are accepted by the Joint Committee on Molding Sand Research, and are incorporated in the above table which, therefore, does not correspond with the table in the description of the fineness test as previously published by the Joint Committee. It is most essential that the requirements of the U. S. Bureau of Standards as to size of opening be met in the use of sieves for testing molding sand.

Sieve Number	Sieve Opening, Millimeters	Sieve Opening, Inches	Wire Diameter, Millimeters	Wire Diameter, Inches	Tolerance in Average Opening	Tolerance in Wire Diameters	Tolerance in Maximum Opening
6	3.36	.132	1.02	.040	3%	15 to 30%	10%
12	1.68	.0661	.69	.0272	3%	15 to 30%	10%
20	.84	.0331	.42	.0165	5%	15 to 30%	25%
40	.42	.0165	.25	.0098	5%	15 to 30%	25%
70	.210	.0083	.140	.0055	6%	15 to 35%	40%
100	.149	.0059	.102	.0040	6%	15 to 35%	40%
140	.105	.0041	.074	.0029	8%	15 to 35%	60%
200	.074	.0029	.053	.0021	8%	15 to 35%	60%
270	.053	.0021	.041	.0016	8%	15 to 35%	90%

DYE ADSORPTION TEST

1. The application of the dye adsorption phenomenon to molding sand is solely for the purpose of ascertaining the nature of the clay substance present. Different sands possess widely different adsorption capacities, and this difference is due exclusively to the quantity of colloidal material present. The colloids in molding sands are mostly of an inorganic nature; hydrated aluminum silicate, hydrated iron oxide, hydrated silicic acid and other hydrated minerals. All of these constituents are of a gelatinous and sticky nature and they import to the sand the property of bond. Strongly bonded molding sands commonly possess clay substance that is high in colloid content as measured by the dye adsorption test. The weaker bonded sands generally show a lower dye adsorption figure corresponding to the smaller quantity of colloids present in the clay substance of those sands.

PROCEDURE

2. Twenty-five grams of molding sand, dried for one hour at a temperature which shall not be lower than 105° C. nor higher than 110°, are weighed into a 500 cubic centimeter wide-mouth bottle fitted with a glass stopper, and 300 cubic centimeters of distilled water, plus 5 cubic centimeters of 10 per cent ammonium hydrate, are added. The bottle is then stoppered, sealed with paraffin wax, and rotated in a suitable machine for 30 minutes (any machine such as that shown in the illustration of a shaker-machine. Fig. 1, of the fineness test, making approximately 60 revolutions per minute and up-ending the bottle with each revolution is satisfactory). At the end of this period 90 cubic centimeters of distilled water are added, plus 5 cubic centimeters of 10 per cent acetic acid. Crystal violet dye is then added in sufficient weight to allow for the adsorption by the colloidal matter and leave a slight excess. For molding sands of weak bond, 0.125 grams of dye is a good amount to start with; while the stronger sands require an addition of 0.150-0.300 grams or more of dye. After adding the crystal violet, the bottle is sealed again and rotated for another 30-minute period. If all the dye is taken up by the colloidal matter, more should be added, as it is necessary that an excess of dye be present over that required to satisfy the adsorption capacity of the colloids.

FIG. 3—COLOR COMPARISON TUBE HOLDER WITH TUBES IN PLACE

3. In order to determine the amount of dye adsorbed by the sand it becomes necessary to find the quantity unadsorbed or held in solution. If the test is allowed to stand over night, suspended material settles out, leaving a clear solution of the dye, and the dye unadsorbed can be determined by color comparison. The standard color solution is made up by dissolving 0.500 grams of crystal violet in 500 cubic centimeters distilled water. Twenty-five cubic centimeters of the clear dye solution are taken from the test by a pipette and run into one of a pair of "carbon" comparison tubes, such as are used in steel analysis (as shown in the illustration of a colorimeter, Fig. 1) diluted to 50 cubic centimeters, and thoroughly mixed. Forty cubic centimeters or more of distilled water are added to the second comparison tube, and the standard dye solution added from a burette until the color matches that of the test in question, taking care that the final volume is the same in both tubes. If it required 2.5 cubic centimeters (0.0025 grams) in the standard tube to match the color in the test, then we have 0.0025 grams of dye unadsorbed in 25 cubic centimeters or 0.040 grams in 400 cubic centimeters. This figure is subtracted from the amount of dye added to the test, multiplied by 4, and the result expressed as milligrams of dye adsorbed per 100 grams of sand.

NOTES

Electrolyte. The presence of ammonium acetate in the test is helpful in that its presence tends to bring about rapidly the subsidence of the fine particles which otherwise would remain in suspension. It has no serious effect on crystal violet. The addition of ammonium hydrate acts as a partial deflocculator and thereby breaks up the agglomerations of clay or other bonding substances.

Dye. Only the highest grade of crystal violet should be used. Impure dye gives low figures and is unstable. Standard dye solution should be kept in the dark, and a fresh quantity should be prepared frequently.

Used Sands. The dye adsorption test cannot be relied upon for all grades of used sands. Impurities present in some heap sands, as for example, seacoal, iron scale, organic binders, etc., seriously affect the adsorption results.

Dye Concentration. The final concentration of crystal violet should be not less than 0.024 grams, or more than 0.060 grams, in 400 cubic centimeter volume. A greater excess of dye gives high reading. After making a few tests it is a simple matter to judge the density of the clear dye solution, and it is essential that the proper concentration is obtained before the test settles overnight.

TESTING EQUIPMENT

The development of testing methods has necessitated the design of special equipment for conducting many of the operations outside the range of chemical analyses. For making the chemical determinations is is unnecessary to supplement laboratory equipment that may readily be obtained from companies supplying that kind of apparatus.

The joint committee has kept in mind throughout the development of the testing methods, the desirability of employing apparatus that can be most easily and economically produced, and requires the least degree of skill in practical manipulation. The committee hopes it will be possible in the future to simplify the design and operation of the testing apparatus, but believes that until suitable data are obtained by experience, investigators should exercise caution in employing modified methods of pieces of apparatus for other purposes than that of experimenting constructively in the desirable continuous campaign to perfect sand testing. When drawing definite conclusions involving comparisons of the work of other investigators, experimenters should adhere strictly to the tentatively adopted methods as the only methods having a standardized status.

To assist foundrymen in securing suitable equipment for conducting those of the tests described in the fore-

going that require special apparatus not heretofore commercially produced, it is recognized as appropriate to indicate sources thought to be reliable from which special equipment can be procured. The prices listed below were recently quoted in lots of one to the joint committee, f.o.b. point of manufacture. It is especially desired that all foundrymen will understand that the purpose in giving this information is simply to assist those who may prefer not to manufacture the special apparatus themselves. Neither the joint committee nor the American Foundrymen's Association is in any sense attempting to promote the sale of equipment made by any particular manufacturer.

direct test and is, therefore, what might be termed a supplementary method, and since the shaker can be easily constructed by anyone desirous of making such test, it has not been thought necessary to ascertain a definite source from which this piece of equipment may be purchased, at a stated price.

There is no reason to doubt that many companies could be induced to make the apparatus mentioned in the preceding list quite as satisfactorily as the companies whose names are shown. It has been impracticable for the joint committee to make extensive inquiry to furnish the names of numerous manufacturers.

Apparatus can be purchased for making all tests except-

SPECIAL TESTING EQUIPMENT

Part	Made by	Price
Cohesiveness mold box base, maple (1)		$8.00
Cohesiveness mold box top, hardwood (1)		2.75
Cohesiveness mold box sides, aluminum (2)		2.50
Cohesiveness mold box ends, aluminum (2)		3.75
Cohesiveness mold box locking plates, aluminum (2)	John Ehne & Sons, 245 Lake Street, Milwaukee, Wis.	3.00
Cohesiveness mold box bottom plate, aluminum (1)		3.00
Cohesiveness mold box strikes, hardwood (14)		4.50
Cohesiveness mold box complete (1)	John Ehne & Sons, 245 Lake Street, Milwaukee, Wis.	27.50
Cohesiveness riddle frame, maple (1)		9.00
Cohesiveness riddle (1) with screen (1) and bumpers (2)	John Ehne & Sons, Milwaukee, Wis.	8.00
Cohesiveness riddles spout, aluminum (1)		3.00
Cohesiveness riddle appartus, complete (1)	John Ehne & Sons, Milwaukee, Wis.	20.00
Cohesiveness motor-pulling device* (1)	Reynolds Electric Company, Chicago, Ill.	22.50
Cohesiveness impact ramming machine, complete (1)	College of Engineering, Cornell University, Ithaca, N. Y.	50.00
Permeability impact ramming machine, complete (1)	J. C. Karr and Company, Cleveland, Ohio	15.00
Permeability impact ramming machine, complete (1)	College of Engineering, Cornell University, Ithaca, N. Y.	15.00
Permeability device for measuring air flow, complete (1) with .5 mm. and 1.5 mm. orific plates	College of Engineering, Cornell University, Ithaca, N. Y.	35.00

*Specify voltage and cycles for A. C., or voltage for D. C.

It will be observed that the above list does not include all of the equipment required for the tests, or any used in making chemical analyses. Apparatus heretofore commercially produced has been purposely excluded from the list. Further exception has been made in omitting the name of a manufacturer of the shaker machine by the dye adsorption test. Since this is an indirect rather than a

ing those for chemical analysis, or in other words, for cohesiveness, permeability, fineness, and dye adsorption, at a total cost of approximately $575. Some of the more expensive equipment specified which has been produced for some time, is found in commercial testing laboratories and is, therefore, conveniently accessible to foundrymen desiring to make certain tests occasionally.

British Art Metal Work

The casket in which the scroll of the freedom of the City of London was presented to the Earl of Oxford and Asquith on May 13, 1925, was manufactured by the Birmingham Guild of Birmingham although the work was executed at their London studio 28, Berners Street. The casket is 8 inches by 4 inches and consists entirely of 18 carat gold. At either end of the casket appear the arms of the City of London in enamel (the supporters and mantling being of finely modelled and chaste gold), with the arms of Lord Oxford and Asquith. The key escutcheon is in richly modelled and chaste gold surmounted by an earl's coronet. On the lid of the casket is the engraved inscription.

Some fine old treasures in the way of altar plate were lately inspected at the Cathedral Church of Birmingham. Some of these pieces are nearly 200 years old. A chalice stands nearly two feet high with a diameter of nearly nine inches and is estimated to contain about a quart of consecrated wine. In this there are 72 ozs. of solid silver. It was bequeathed in 1742 with two flagons each containing over 81 ozs. of silver, and two large patterns measuring nearly 18 inches across and containing 51 ozs. each. Other treasures include a silver gilt chalice with medallions commemorating the centenary of St. Phillip celebrated in 1815.

An excellent example of artistic metal work is furnished by the gates which are to adorn the Queen Victoria memorial provided for Canada which have been executed by Bromsgrove Guild, near Birmingham, England, after designs by Sir Aston Webb. These gates were executed in iron with bronze enrichments, and are considered some of the best work turned out in the way of ornamental gates for some years. Recent productions include Australian screens executed by the same Guild, in iron with bronze enrichments. Bromsgrove work in the form of gates adorns the Worlec Palace, Central India, the Amar Mahal, Jammu, the palace of Rajah Sir Hari Singh Sahib, the Bank of Commerce, Winnipeg, and the Anglo-South American Bank at Santiago. Nearer Birmingham is the Cartwright Memorial, Bradford, the choir gates of Liverpool Cathedral, executed in bronze and the gates of many of London's palatial business houses. In Birmingham itself, the bronze doors of the Hall of Memory are now in course of construction.—J. H.

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Conclusion

By WILLIAM CAMPBELL†

NON-CORROSIVE ALLOYS

	CHROMIUM CR	COBALT CO	NICKEL NI	COPPER CU	IRON FE	OTHER ELEMENTS
Bario (sheet)	4.25	....	90.	....	....	W, 1.2; Si, 0.3
Bario-Metal, Soft	20.	60.	....	....	....	W, 20.
Bario-Metal, Hard	30.	30.	....	....	....	W, 25.; Mn, 10.; Ti, 5.
Borcher's	30.	35.	35.	....	....	
Borcher's	30.	34.	34.	....	....	Ag, 2.
Borcher's	30.	35.	35.	....	....	Mo, 0.5–5
Borcher's	36.	....	....	....	60.	Mo, 4.
Borcher's	65.	....	....	....	35.	
Brix	15–20	....	60–75	5.	....	Si, 4.; W, 1–4; Al, 2.; Mn, Ti 3; B, 1
Cobaltcrome	13.6	3.7	....	....	79.5	Mo, 0.84; Si, 0.8; C, 1.5
Cobaltcrome	30–25	5–10	....	....	70–60	
Cufenium	....	....	22.	72.	6.	
Cuniloy	....	....	65.	25.	....	Mn, 35.; Pb 1.
Delhi	18.	....	....	....	....	Si, 1.5; C, 0.3–0.6; Mn, 0.3
Duke's Metal	....	....	40.	30.	30.	
Duke's Metal	11.8	4.7	....	....	89.8	W, 0.35; Si, 0.6; C, 1.45
Haynes Metal	20–30	5–25	....	....	10–75	
Haynes Metal, Hard	15.	45.	....	....	....	W, 40.
Haynes Metal, Soft	10.	62.	....	....	....	W, 28.
Ilium	21.	....	62.5	6.5	1.	Mo, 5; W, 2; Mn, 1; Al, 1.
Krupp's V1M	14.25	....	2.25	....	Bal.	C, 0.1
Krupp's V2A	23.	....	9.5	....	Bal.	C, 0.4
McFarland and Harder	43.	....	46.	11.	....	
McFarland and Harder	30.	....	59.	11.	....	
McFarland and Harder	10.	....	48.	43.	....	
McFarland and Harder	16.	....	29.	55.	....	
Nevastain	9.5	....	....	....	Bal.	Si, 3.8; C, 0.43
Non-Oxidizable, Lemarquand	....	8.	7.0	39.	....	Zn, 37.; Sn, 9.
Non-Oxidizable, Marties'	....	....	35.	17.	10.	Zn, 18.; Sn, 10.
Parr	15.	....	80.	5.	....	
Parr	18.	....	66.6	8.5	....	W, 3.3; Al, 2.0; Mn, 1.; Ti, 0.2; B, 0.2
Sea Water	1.2	....	24.	....	Bal.	Mn, 0.6; Si, 0.35; C, 0.5
Sea Water	....	....	16.7	....	....	Mn, 5.; Si, 0.3; C, 0.7
Sideraphite	....	....	23.	5.	63.	W, 4.; Al, 5.
Stainless (Armstrong)	12.	....	....	....	Bal.	Si, 5.; C, 0.45
Stainless (Brearley)	13.	....	....	....	Bal.	C, 0.3; Mn, 0.3
Stellite	25.	75.	....	....	....	
Stellite	25.	70.	....	....	....	W, 5
Stellite	15.	60.	....	....	....	W, 25
Stellite	15.	55.	....	....	....	W, 25; Mo, 5.
Stellite	15.	45.	....	....	....	Mo, 40.
Stellite	20–23	55.	....	....	3–5	W, 15–20; C, 1.5–4.0
Stellite	33.6	55.6	....	....	....	W, 9.2; C, 1.5
Stellite	26.4	34.5	....	....	10.	W, 12.5; Mo, 9.5; C, 1.8
Stellite	13.2	60.8	....	....	0.5	Mo, 24.1

	SI	MN	C	P	S
Duriron	14–14.5	0.25–35	0.2–6	0.16–0.2	0.005
Duriron	14–15	2–2.5	0.75–1.25	0.05–1	0.05–0.15
Corrosimon, Ironac, Elianite	Similar				

*This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 appeared in our issues of March, April, May, July, September, December, 1923; June, July, August, September, 1924; May, June and November, 1925.

†Professor of Metallurgy, School of Mines, Columbia University, New York.

Chromium Plating Troubles

A Discussion of the Obstacles Encountered in Chromium Plating and the Precautionary Measures

By PIPETTE

So many alluring accounts of so many systems of chromium plating have recently appeared in the technical press, that a short article of a mild cautionary nature would surely not be out of place. Chromium is a beautiful metal; and it is not denied that the prospect of an unoxidizable coating on iron and steel is a very attractive one, but the writer would hate to think that any simple soul should, at this early day, contemplate the beauty of the metal and then order a chromium bath from his supply house, exactly as he would a nickel bath and with as few forebodings.

THE CHEMISTRY OF CHROMIUM

The chemist, regarding chromium as an element in a certain position in Mendeléeff's periodic table, will approach it with no illusions as to its ease of manipulation. Chromium is grouped with molybdenum, tungsten, and uranium in sub-group VI.A of that table. In its chief basic oxide, Cr_2O_3, it is allied to aluminium and iron. Thus, like aluminium hydroxide, chromic hydroxide $Cr(OH)_3$ is able to form salts with alkalis, the chromates. Again, chromic sulphate, also like the sulphate of aluminium, forms "alums."

It can be deduced from this table that, in any solution, say, of chromic acid salt and sulphuric acid in water, under the action of a reducing agent (nascent hydrogen in the case of a plating solution), the chromium will be found in a bewildering number of transformations. In any one molecule it can be a base, an acid radical, and both, e.g., chromium sulphate, chromium chromate, potassium dichromate, sulphochromyl sulphate, etc. The potassium dichromate, when reduced, will go to the alum $K_2SO_4.CR_2(SO_4)_3$, 24 H_2O, and, if not allowed to regress, will be finally reduced to metallic chromium at the cathode—at any rate that is the idea.

Unfortunately, there seems no doubt that a chromium ion, negatively charged, will start dutifully on its journey to the cathode—the "work"—but, half way over, will suddenly, so to speak, alter its mind and determine that it is an acidic radical with a plus charge, and start on the return journey—and there is no chromium plating on **that** occasion.

THE NECESSITY FOR THE COLLOIDAL STATE—THE FUNCTION OF HYDROGEN

The chemistry of the chromium plating bath is exeremely intricate and doubtful—as a matter of fact it really is in any bath, but the chemist will not admit it—but two things are clear. Firstly, that chromium will behave either electro-negatively or electro-positively, on the slightest provocation, and, secondly, that a colloidal state is a necessary stage in the metal's progress from the anodes, via various alterations from metal to acid, to its deposition as a metal on the cathode.

All this necessitates certain imperative conditions in the solution, and the most important and annoying of them is this: An enormous excess of nascent hydrogen, must be produced by the current in order to reduce the metal finally at the cathode, and also to diffuse through the solution so that the erring wanderer may be kept in the right path.

In plating solutions where the metals are consistently metallic, such as copper sulphate baths, nickel sulphate, double silver cyanide, etc., no intermediate colloidal state is necessary, because the metal is able to pass from its salt or solvent to its metallic state directly. But the formation of chromium colloids seems absolutely necessary, and their formation is best effected by working the new solution very hard for an indefinite time, sometimes several weeks, without the slightest adherent deposition ensuing. It seems certain, too, that if the bath is not kept in constant employment, another long period of fruitless working will be needed to bring it back to any practical efficiency.

THE PRACTICAL PROBLEMS ARISING FROM THE HEAVY HYDROGEN EVOLUTION

If the difficulty of obtaining a colloidal solution of chromium can be surmounted by patience and much current, the danger and difficulty of the excessive gas generated remains a serious workshop problem. It is more than a gas, it is a spray, and a spray of chromic acid and sulphuric acid ejected by hydrogen gas is as virulent and energetic a thing as the writer wishes to meet. If it is not trapped, it leads to bleeding noses, destroyed mucous membranes, and irritated lungs; clothes are quickly destroyed, and flesh badly burned. If the gas and spray is trapped, great caution is essential that a gas pocket is not formed, for such a pocket is liable to be fired by a stray light, or even a slight electric spark. Elaborate hoods must be fitted over the baths, and efficient flues erected. If no such arrangements are made you will have no workers, and if bad arrangements are made you will have no factory. The explosion of even a tiny gas pocket is quite an exciting affair. A big one is apt to remove most of the wall and all of the roof.

CURRENT REQUIREMENTS AND RUST RESISTING PROPERTIES

As will be readily appreciated, the generous evolution of gas is at the expense of a large current expenditure. The bath requires from 150 to 200 amperes per square foot of cathode surface, and at least 75 per cent. of this current is used in the decomposition of the electrolyte and the heating of the solution. Since the bath apparently will not work at much above room temperature (90° Fah. at the most) either it must be water cooled or the operation suspended to allow the solution to cool.

It would be manifestly unfair and foolish to magnify these defects and account them insuperable; especially so if the results justified all the care and expense that the process involved. Now it is certainly true that metallic chromium does not oxidize or "rust" in normal circumstances. This, however, is not quite the point. "Rust prevention" obviously means preventing the main underlying metal from rusting, and for this chromium is by no means perfect.

To be a perfect rust preventer, a deposited coat of metal must be absolutely adherent, absolutly continuous, and must completely "seal" the underlying metal. A really continuous and adherent coat of chromium, of course, would be ideal; but, unfortunately, the ideal is rarely obtained, and the ugly fact remains that iron plated with a porous coat of chromium rusts far more quickly and more thoroughly than if it had never been plated at all. An electro couple is set up between the two metals in the presence of percolated moisture, and corrosion proceeds at an alarming rate. The gleaming chromium shows at first no signs of this. It is a whited sepulchre hiding the decay

and corruption which exists beneath the bright coating.*

An experimental steel ring sent by Messrs. Cannings was apparently perfect in both adherence and continuity, yet it was eaten away so badly by three days' exposure to the atmosphere that the deposit dropped away completely.

HEAT TREATMENT—FINISHING

It has been suggested, and experiments have been carried out, that heat treatment will result in a chromium steel (stainless steel). Prof. Bancroft has stated the temperature needed to effect this union to be 1,200° C., a formidable temperature for ordinary plater's workshop practice. Conclusive data as to the success of the operation is not yet to hand.†

The final operation—finishing, though not easy, is practicable. The chromium is far too hard to be finished on a calico mop. Felt with plenty of green rouge compo must be employed.

CONCLUSIONS

Chromium anodes can be employed, though their cost is high, and no positive figures are available as to how far the solution feeds from them. If lead anodes are used, periodic replenishment of the solution is necessary. This replenishment, together with the cost of specially fitted vats, protection for workpeople, high current losses, subsequent heat treatment, and extra labor in finishing all tend to make the process an expensive one.

The writer does not state that the difficulties of the process are insuperable ones; he does not suggest that the costs may not subsequently be reduced, certainly he does not say that chromium plating may not soon be as efficient, certain, and cheap as any other metal, but merely that the demerits, the dangers, and the cost should be considered by business men.

* Some interesting data concerning this aspect of the subject were given by A. E. Ollard, in a recent paper before the British Association, and in Mr. MacNaughton's discussion thereof, both reported in THE METAL INDUSTRY, November, 1925.—ED.

† G. M. Enos, in a paper presented before the American Electrochemical Society, and abstracted in THE METAL INDUSTRY, October, 1925, page 417, seems to suggest that there is no advantage in such treatment.—ED.

Problems Encountered in Machining Brass Rod

By JOHN L. CHRISTIE

Metallurgist, Bridgeport Brass Company, Bridgeport, Conn.

This paper is a discussion of a paper on High-Speed Cutting of Brass and Other Soft Metals in Machine Tools, by Luther D. Burlingame, presented at a meeting of the A.S.M.E. Machine Shop Practice Division in Mason Laboratory, Yale University, New Haven, Conn., September 10, 1925. Mr. Burlingame's paper appeared in the September, 1925, issue of Mechanical Engineering, p. 705 and this paper appeared in the November issue.

The present discussion of Mr. Burlingame's paper is submitted in an attempt to bring about a closer understanding between the manufacturer and the user of brass rod. A knowledge on the part of each one of what the other is trying to accomplish and of the difficulties and limitations he meets, is essential to mutual satisfaction.

Both the manufacturer and user are fortunate in that brass rod has been standardized as to sizes, composition, and general method of manufacture.

Occasionally, special requirements on the part of the user demand a special rod. This entails either a composition different from the standard, a different processing in manufacture, or both. This is of interest in connection with the first paragraph in the paper in which the author referring to operating on soft metals, states that there is as yet no standardized practice. We have known of instances where two different screw-machine-operating concerns, making the same part for the same customer, required different rods because of their different set-ups. One was able to use the standard rod shipped from stock, while the other demanded a rod of special properties.

Referring now to the section of the paper entitled The Kind of Metal to be Used, the term "hard" has a different meaning to the manufacturer and to the user. The same, of course, applies to the term "soft." To the user the term "hard" applied to brass rod means that it is difficult to cut; the term "soft" means that it is easy to cut. To the manufacturer the term "hard" means high tensile strength, stiffness, high Brinell, scleroscope, and Rockwell hardness numbers, and does not necessarily mean that the rod is difficult to cut. The manufacturer, for the cutting qualities, uses the words "free-cutting" and "not free-cutting."

In steel and in iron, metal that has high strength, high Brinell, etc., is in general not free-cutting and metal that has low strength and low Brinell is free-cutting. In brass the same relation does not necessarily hold, and the most important factor in determining free-cutting properties is the lead content. This should be maintained at about 3 per cent; if it runs materially above this, trouble will be experienced in manufacture and in the rod itself due to lack of strength; if it runs below about 3 per cent, the maximum free-cutting properties will not be attained. The difference in lead content explains why, as Mr. Burlingame states, brass rod made abroad does not cut so readily as similar stock made in this country. It also explains why tubing as a rule is "harder" (in the meaning of the user) than brass rod. When the lead content of brass tubing is higher than about 1 per cent, considerable difficulty in manufacture is encountered. The hardness (strength, stiffness, etc.) of brass is controlled largely by the amount that is drawn either from the extruded size or after the last anneal. This, however, has comparatively little to do with the free-cutting properties of the rod. The rod should be drawn stiff enough so that the cutting tools will not push it out of shape. And the best results, of course, are obtained by accurate control of the composition and processing of the rod.

An interesting example of the difference in the meaning to the manufacturer and to the user of brass rod of the word "hard" occurred a few years ago. A customer of the Bridgeport Brass Company and a large user of brass rod complained that he was having trouble on one particular size of rod. He stated that the rod was hard, was dulling tools and breaking drills, and was generally unsatisfactory. An investigation showed that a drilling operation was being performed at the same time that a wide, heavy forming cut was being taken from the side. The forming cut was so heavy that the piece was actually being bent out of line with the remainder of the rod. This caused the axis of the end of the piece to move in a circle, thus snapping the drills, dulling the tools, and breaking the rod. It was found that by giving the customer a rod which had been drawn stiffer—in other words, which was harder in the mind of the manufacturer—the trouble was eliminated and the customer well pleased. In this case a rod that was thought to be too hard was really not hard enough.

Electro Tin on Red Brass

A Comparison of Belgian and American Practice

BELGIAN PRACTICE

By Electro-Tinner

Before tinning by electroplating, the pieces must be perfectly clean because even traces of foreign matter attached to the objects prevent the coating of tin from adhering, so that there are stains and the tin comes off easily.

CLEANING

These preliminary operations are called **cleaning.**

For copper or bronze parts we have obtained very good results by dipping them in a bath of hydrochloric acid for **a few seconds.** They can also be dipped in a bath of hydrochloric or sulphuric acid containing from 5 to 20 parts by weight of one of these acids to 100 parts of ordinary water.

The objects can remain longer in the latter baths because they do not bite so deeply.

In any case after this operation the objects must immediately be washed with clean water several times to remove all traces of acid, and they must be energetically rubbed with a hard brush or even with clean sand so that the parts may be quite brightly polished. They are then washed once more with clean water.

If there are any bumps or unevennesses on the surface of the parts they must be scraped with a hard brass or steel point or with a brass wire brush.

Oil or grease spots must be removed with the same care. This can be done by boiling the objects in a caustic soda solution dissolved in ten times its weight of ordinary water. But up to now we have not found this necessary, probably because our tinning bath mentioned below, which has given us the best results, also contains some caustic soda.

In any case the objects must not be dried after being cleansed, as for instance with a rag, and they must not be handled too much because they become dirty again.

It is also advisable not to wait too long before tinning the objects after they are cleansed, as they become covered with dust and the tin does not adhere properly.

TINNING BATH

We have tried several compounds and experience has shown that the best results are obtained with a caustic soda alkaline bath.

The books we have consulted on the subject indicate the following formula:

Crystallized tin chloride . . .	25 grammes
Caustic soda	40 grammes
Water (about 1 liter)	980 grammes

We did not have much confidence in the tin chloride sold on the market, because it often contains lead chloride among other things, and it is essential there should be no lead for the following reasons:

During the electrolysis the tin is deposited on the cathode, that is on the objects to be tinned which form the cathode. If there is any lead in the bath it is deposited at the anode under the shape of lead dioxide. As we use a tin plate as anode which must dissolve, in order to keep the same proportion of tin in the bath, this plate after a certain time would be covered with lead dioxide and the tin would no longer dissolve.

We therefore had to find a pure tin compound.

It would be possible to dissolve some pure tin in pure hydrochloric acid, but this takes a long time. We preferred using some tin ground to a fine powder and treated with nitric acid. This immediately bites into the tin, and there is no need of heating as the operation develops so much heat that it is even advisable to add a little distilled water to slacken up the process.

This is naturally done in a glass container. The nitric acid transforms the tin into metastannic acid which is insoluble in water.

If there was any lead, copper, etc. in the tin used these metals are transformed into soluble nitrates, which can be removed by successive washings and absolutely pure metastannic acid can therefore be obtained.

When the very strong reaction of the nitric acid has ceased the container must be heated for a time at a temperate heat. In case the material dries up a little water can be added; also a little nitric acid. This is to be heated until the metastannic acid which has formed is a very pure white and there is no further action from the acid nor any grains of tin left at the bottom of the container. To do this a little more nitric acid sometimes has to be added.

The metastannic acid must now be washed. **Boiling** distilled water is added so as to fill the container almost completely, it is then shaken strongly, heated a little and allowed to rest. Metastannic acid is deposited with great difficulty. The solution floating on the water keeps for sometime a milky appearance. If any loss is to be avoided, the floating solution is carefully transferred to a filter so as not to carry the sediments and this solution is as far as possible poured onto the filter. An additional quantity of boiling water is poured onto the sediments which remained in the container. This is shaken, heated a little, allowed to rest and again transferred to the filter.

As a rule the washing is completed when this operation has been repeated three times, and this can be ascertained by making sure that the water dripping out of the filter is no longer acid. The sediments remaining in the container are pure metastannic acid.

Since the quantity of tin used has been weighed it is easy to ascertain the quantity of metastannic obtained. If the quantity is sufficient the metastannic acid which has remained on the filter can be put back into the container, the contents of which must now be dissolved in caustic soda.

For 100 parts of tin with which we started, theoretically 75 parts of caustic soda are required, but it is advisable to take more; particularly as an excess of caustic soda gives no trouble in the electrolytic process. We can therefore take 50% more, or about 100 parts of tin to 110 parts of caustic soda.

This caustic soda is first of all dissolved in distilled water and this is added to the metastannic acid sediments and boiled.

There usually remains some metastannic acid which did not dissolve. This is allowed to rest if a clear solution is required and the clear liquid is then transferred to another container, but this is not indispensable. A murky solution can be used for electrolysis.

Distilled water is added so as to have a solution containing about 13 to 14 grammes of tin per liter. This solution is very satisfactory for electrolytic tinning.

TINNING

The above solution can be employed cold but the tin does not adhere properly.

It is much better to use a hot process, almost at boiling point. A very fine, grayish white deposit is thus obtained

and it adheres strongly. Naturally electrolysis should be done preferably in a porcelain or enamelled plate tub, this being electrically insulated and proof against caustic soda.

A tension of approximately 4 volts is used either by means of electric cells, or better still, of storage batteries, or of any other electric sources, the voltage of which can be regulated by a rheostat.

The parts to be tinned are suspended in the bath and put in contact with the negative pole by a copper conductor. A tin plate is connected to the positive pole and is used as a soluble anode.

The current density is regulated so as to be of 1 to 1½ ampere per square decimeter of the total surface of the objects to be tinned. The regulation is effected by dipping the tin plate more or less in the bath and placing it more or less close to the objects to be tinned.

It must not, however, be placed too close, as in this case the tin coating is thicker on that part of the objects which is closer to the anode and the coating is of uneven thickness. It is even possible that specks of gray tin should be formed which come off, fall to the bottom of the bath and may cause short circuits.

Care must be taken that all the parts of the objects are in contact with the liquid and that no air or gas bubbles should remain on certain points as there would be no tin coating on such parts.

For certain parts with which it is almost impossible to satisfy this requirement they are first tinned for 20 minutes; then they are turned over and tinned again for another 20 minutes. For toothed wheels these are hung so that they can be turned a little at a time and the tin deposit is thus formed between all the teeth.

It must be noted that caustic soda of which there is a slight excess lets out a little hydrogen at the cathode as it becomes electrolyzed. It is this gas which sometimes accumulates on certain parts of the objects and prevents the tin coating from being formed.

After a few trials all objects can be tinned perfectly.

When a good many pieces have been tin plated, a little caustic soda or even a little tin solution, as mentioned above, should be added.

It can be detected when the bath is getting thinner because the amperage decreases.

After the tin plating the objects are taken out of the bath and washed with running water and a brush. They can be polished as bright as silver by rubbing them with a rag and a little fine wet sand. Naturally they must not be rubbed too hard or too long, as the tin coating would come off. It is thus easy to ascertain if the coating adheres strongly. The finished pieces are then dried.

It is indispensable that objects should be washed as they come out of the bath, as after a few days the caustic soda again bites into the tin and some of the copper surface shows.

AMERICAN PRACTICE

By Charles H. Proctor

I have reviewed the data submitted covering the electro-tin plating of red brass. I can only affirm the data and methods of procedure as being according to American practice used in electro tin plating similar articles and substantially correct.

In American practice, however, we use solutions from two to four times stronger than advocated above. The crystallized tin salt is replaced by sodium stannate. The following formula gives a rapid tin deposit.

Water	1 gallon
Sodium stannate	24 ozs.
Caustic soda 76%	4 ozs.
Powdered yellow rosin	¼ oz

Crystallized tin chloride when dissolved in caustic soda becomes converted to sodium stannate. In my opinion it is not necessary to prepare your own crystallized tin chloride. It can be purchased commercially pure enough from various sources.

Composition of Steam and Red Brass Alloys*

Used for	Copper, %	Tin, %	Lead, %	Zinc, %
Plumbers' brass good	84.00	4.00	4.00	8.00
Plumbers' brass goods	85.00	5.00	5.00	5.00
Valves and steam fittings	87.00	4.25	1.50	7.25
Faucets, analysis	87.55	3.60	4.00	4.85
Wagner's valve, Chemnitz, Germany, No. 1	84.00	4.00	2.00	6.00
Wagner's No. 2 valve	94.00	4.00	2.00	....
Waste and stopcocks	85.00	7.00	3.00	5.00
Transit Development Co., steam fittings	88.50	5.50	2.50	3.50
Valves (Globe)	85.00	4.00	5.00	6.00
Radiator valves	84.00	4.00	4.00	4.00
Stem check-valve bonnets	72.00	9.00	2.00	17.00
Radiator valves (cheap)	87.75	3.50	2.00	7.00
Radiator valves (cheap)	77.00	3.00	10.00	10.00
Valve body (cheap)	84.00	3.50	6.25	6.25
Steam metal	88.00	5.00	3.50	3.50
Cheap red (very soft)	83.00	....	8.50	8.50
Cheap red (soft)	83.00	1.00	8.00	8.00
Plumbers' red brass	83.00	2.00	4.00	11.00
Cheap, half red	83.00	1.00	6.00	15.00
Tough yellowish red	85.00	2.00	3.00	15.00

Used for	Copper, %	Tin, %	Lead, %	Zinc, %
Red (good color)	82.50	1.50	6.00	10.00
Gasoline stove burners	80.00	3.00	3.00	15.00
Sprinklers	85.00	3.00	2.00	10.00
Valves and fittings (cheap)	73.00	1.75	6.75	18.50
Water cocks and bibbs	82.00	2.00	8.00	8.00
Molds for casting soft metals	91.00	6.00	1.00	2.00
Key metal	80.00	10.00	5.00	5.00
Screen plates	85.00	5.00	8.00	2.00
Plumbers' faucet yellow	70.00	....	3.50	26.50
Hose couplings	65.00	2.00	3.00	30.00
Cheap composition	85.00	3.00	3.00	9.00
Statuary bronze	90.00	6.00	1.00	3.00
Bureaus statuary bronze (1)	89.50	7.00	0.50	3.00
Bureaus statuary bronze (2)	89.50	5.00	0.50	5.00
Ordinary steam metal	88.00	5.50	2.50	4.00
Trolley wheels	92.00	6.00	....	2.00
Trolley ears	85.00	3.00	3.00	9.00
Pattern castings	80.00	8.00	2.00	2.00
Carburetors	87.00	7.00	3.00	3.00
Name plates	86.00	3.00	2.00	9.00
Hardware bronze	85.00	3.00	3.00	9.00
Analytical scale beams	79.00	18.00	1.00	2.00
Bullion balance beams	84.00	13.00	1.00	2.00
Bolts and nuts	90.00	8.00	....	2.00
Marine hardware	88.00	5.00	2.00	5.00

* From the booklet "How To Cut Crucible Costs," published by the Publicity Bureau of the Plumbago Crucible Association.

The Centennial of Aluminum—1925

Written for The Metal Industry by Dr. ROBERT J. ANDERSON, Consulting Metallurgical Engineer, Cleveland, Ohio

The discovery of aluminum has generally been credited to Frederick Wöhler, then professor of chemistry in the University of Göttingen, under date of 1827. It has been known from documentary evidence, however, that Oersted had worked on the problem of reducing aluminum as early as 1824. In a recent communication to Chimie et Industrie (vol. 13, 1925, p. 9), Matignon and Faurholt claim that the real metal was first isolated by Oersted in 1825. The evidence of Matignon and Faurholt appears to be sound, and if so, the year 1925 marks the centennial of the isolation of metallic aluminum.

It is well known that Sir Humphrey Davy had some years before the experiments of Oersted and Wöhler isolated both potassium and sodium by electrolysis of their hydroxides, while Berzelius had decomposed silicon fluoride, obtaining silicon in the form of a brown powder. Both Davy and Berzelius had also worked on the aluminum problem. The experiments of these workers may be passed over since they were unable to isolate the metal.

Oersted first proposed to chlorinate alumina, and then reduce the aluminum chloride with hydrogen, but the experiment was a failure. He next used potassium amalgam as the reducing agent and obtained a reduction. This experiment was described before the Danish Society of Sciences, and the results published in the early part of 1825. A sample of the metal reduced was presented to the Society. It was described by Oersted as having the appearance of tin. The minutes of the Danish Society contain a record of this experiment. Several letters which passed between the Society and Oersted are also extant, and Oersted also wrote another account of this work, which, however, was evidently never published.

In 1827, Wöhler reduced aluminum from its chloride by the use of potassium alone, obtaining the metal as a gray powder. Wöhler published the results of his work in 1827. He mentions the experiments of Oersted, but states that his (Wöhler's) metal was not obtained by the use of potassium amalgam. According to Matignon and Faurholt, Wöhler had visited Oersted in Copenhagen and obtained information on the preparation of metallic chlorides. According to the late Dr. J. W. Richards, potassium amalgam will not reduce aluminum chloride. Matignon and Faurholt, however, claim that aluminum can be reduced from its chloride by the use of potassium amalgam as well as by potassium alone, and assert that the amalgam yields the metal in metallic form having some lustre, while the potassium alone yields a powdery mass. Hence, it is asserted that Oersted was the first producer of metallic aluminum, and not Wöhler. The fact that Oersted described his metal as having the appearance and lustre of tin adds weight to the argument of Matignon and Faurholt, since it is known that Wöhler's metal was first obtained in the form of a grayish powder. It was not until 1845 that Wöhler was able to obtain the metal in small malleable globules of metallic appearance. In 1826, Oersted described the properties of the metal in a published paper, making mention that it possessed a metallic lustre.

According to Matignon and Faurholt, Madam Kirstine Meyer recently found certain documents among Oersted's papers, which give descriptions of the methods to be used for the preparation of aluminum. These documents are to be published. Among other items, it is stated that when the amalgam is used the reduction can be carried out in a glass tube, which is not the case when potassium is employed. The double potassium aluminum chloride gives better results than aluminum chloride. The former salt has low melting point, and globules of reduced metal can collect readily beneath a layer of it.

The early experiments of Oersted and Wöhler brought little advance in aluminum until the experiments of Deville in 1854, while important commercial production of the metal did not commence until the development of the Hall-Heroult process in 1889. Although 100 years old, the rise of the world's aluminum industry has taken place in the past 35 years, and the greater part of the industrial progress in the use and applications of the metal in the past 25 years. Oersted and Wöhler would be amazed to see the world's aluminum industry today with its output at the rate of 400,000,000 lbs. per annum, and the good possibility that it will be second to tonnage output among the non-ferrous metals by 1935 or 1940.

Wage Incentives*

By B. R. Mayne, Saginaw, Mich.

The group bonus plan as worked out at the malleable iron plant of the Saginaw Products Company is stated to be an extremely satisfactory solution of the wage problem as related to the malleable iron foundry. The first consideration to be given in the interest of group bonus plan is to establish a unit of measure. The unit in the plant described is that of 1,000 pounds of customer's good castings. This unit is obtained from the daily records of the foundry report and the number of units accomplished is available within 36 hours from the time the last casting is poured for that day. At this plant there are 17 groups in operation under the group bonus plan all being controlled by the same unit of measure for work done. The author first illustrates how and when a bonus should be paid to a group. The starting point of the bonus payment begins when 75 per cent of standard efficiency is reached. Under this plan an employee receives a guaranteed hourly rate, which is set at a fair point for the community and for the class of work done. The bonus system as operated gives the individuals of the group an opportunity to increase their hourly earnings to a predetermined scale of payment. Payment of this bonus is made at the end of a two weeks' pay period and one pay check includes the hourly base rate for the total actual hours and the per cent of this total, according to the efficiency maintained throughout the pay period.

The author describes the method of setting bonuses for the various groups, which include such groups as the following: Core room labor; core delivery and core assembly; pouring iron; shifting weights and molds; operating bull ladles; night work; melting; hard iron smelting; sorting and grinding; annealing; and foreman bonuses. Time study is used in determining rates of the various operating groups.

*Abstract of a paper read at the Syracuse meeting of the American Foundrymen's Association, October, 5-9, 1925.

National Founders Association

Report of a Meeting to Promote Better Understanding Between Industry and Agriculture and a Conference on State and Local Economy and Taxation Reduction, Held at the Hotel Astor, New York City, November 18 and 19, 1925

ABSTRACTS OF ADDRESSES

Why This Conference?

WILLIAM H. BARR

President of the National Founders Association

The federal government has given us an admirable object lesson in the reduction of taxes and the enforcement of economy in national expenditures. Without this economy there could be no material reduction in federal taxes, and it is a similar economy, coupled with intelligent administration, which is needed in state and local affairs.

Who Pays the Taxes?

JAMES A. EMERY

Counsel, National Founders Association

The three groups here represented are peculiarly related to each other, for each is especially dependent upon the other to make its own way in the world. The factory is sometimes said by the short-sighted to compete with the farm for its labor and thrives at its expense. On the contrary, the history of our daily life demonstrates that the doorway of the manufacturing establishment is the passageway to opportunity through which thousands of farmers' sons have passed to larger earning power and the higher places of industrial reward. Fundamentally there is no conflict but the most intimate interdependency between field and factory.

Taxes, the Great American Crop

WILLIAM J. THOMPSON

Former Chairman, Executive Committee, National Grange, South China, Maine

Since taxes are the outcome of governmental functions, the only way to lessen them or to prevent their increase, aside from economics in operation, is to check the rapid growth of governmental functions and centralized government, which if continued, will inevitably lead to the European condition of government regulation of business and taxes, and finally to a state of socialism.

Taxation as a Family Burden

ALLAN ROBINSON

President, Commonwealth Bond Corporation, New York City

We are in a period of great prosperity in this country. Our horizon seems clear. Peace sits at our national boundaries. Unemployment is negligible. It is hard to draw ourselves away from the contemplation of these favoring circumstances and take up the tedious task of solving tax problems. But this is the time to do it, not later, when over-taxation has become a staggering burden and business recession has left us without the earning power to shoulder it.

The Economic Importance of Reduction in Railway Taxation

R. H. AISHTON

President, American Railway Association, Washington, D. C.

Every individual is interested in the problem of taxation, and in the means of reducing, stablizing, and adjusting taxes to a more equitable basis. Every industry is interested, for taxation levies its toil on every penny of income and revenue. Every corporation is vitally interested, as a glance at its income account will reveal, for taxation is busy there with its slashes at net income. It is one of the subjects in which there is universal interest and with repect to which we can all unite on a common policy.

Tax Control Through State and Local Group Action

C. A. DYER

President, Lower Taxes-Less Legislation League, Legislative Agent, Ohio State Farm Bureau Federation and Ohio State Grange

What has been done in Ohio can be done in every State in the Union. If we are to have more efficient and less expensive government, the tax paying interests of the State and of the taxing districts must get together around the council table, find out the facts and agree upon what is best to be done, and then, by united effort, see that it is done.

The Need for Improved Foundry Methods to Overcome Foundry Labor Shortage

H. M. LANE

President, The H. M. Lane Company, Detroit, Michigan

Practical suggestions for overcoming labor shortage through improved methods.

Industry and the Public Schools

L. A. HARTLEY

Director of Education, National Founders Association

The present day attitude of the schools toward industry, the changes which would be advantageous and how to effect them.

Cadmium Plating Patents

In the November issue of THE METAL INDUSTRY, page 463, in Problem 3448, on Cadmium Plating, through a clerical error, it was not mentioned that the use of mercury in cadmium solutions or cadmium zinc solutions is now controlled by the following patents:

No. 1,555,537, September 29, 1925;
No. 1,556,272, October 6, 1925,
by Charles John Wernlund, Tottenville, New York, assignor, and the Roessler and Hasslacher Chemical Company, 709-6th avenue, New York City.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1925 by THE METAL INDUSTRY PUBLISHING COMPANY, Incorporated

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year : : SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

ADVERTISING RATES ON APPLICATION. FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon........................Editor and Publisher
Adolph Bregman..............................Managing Editor
Thomas A. Trumbour..........................Business Manager
Evan J. Robinson..........................Advertising Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number: Beekman 0404. Cable Address: Metalustry

Vol. 23 New York, December, 1925 No. 12

Contents

Buyers' Guide—Advertising Page 77. Edition this month, 6,000 copies.

EDITORIAL

A LIST OF ALLOYS

In this issue, we conclude the serial publication of A List of Alloys by William Campbell,* compiled for the American Society for Testing Materials. The publication of this list began over two years ago and although we could have reprinted it completely by devoting a special issue to it, our purpose was not to replace or compete with the booklet published by the American Society for Testing Materials, but rather to draw attention to this booklet so that we could aid in its adequate distribution.

Dr. Campbell has done a noteworthy and important piece of work in compiling this list. Admittedly, it is not "complete," but we are firm in the belief that no list of this sort can possibly be complete. New alloys and old alloys under new trade names crop up daily and die out as quickly. By permutations and combinations the number of possible alloys is almost infinite, and this fact seems to have been taken full advantage of by inventors.

THE METAL INDUSTRY has made a practice for many years of publishing metal mixtures. From time to time we have published various lists of practical foundry mixtures, such as Frank Zeller's and F. W. Loll's. Our latest and most ambitious program, Dr. Campbell's List of Alloys, of course, includes most of these and points out with definite finality the need for a small number of standard serviceable mixtures.

To us the purpose of such a list is only partially the publication of known alloys. It is also a vivid illustration of the fact that our lists need simplification. There is no earthly reason for the existence and use of hundreds of metal mixtures differing from each other by fractional percentages. Half a dozen alloys will cover the field where now a half a dozen hundred may exist.

All this is, of course, in a sense, post mortem. The Federal Specifications Board, the American Society for Testing Materials, the American Engineering Standards Committee, and other organizations are working on just this problem and our discussion is not to urge them on, as they need no further urging. It is to urge our readers to cooperate with these bodies and to accept their recommendations in every possible case. Both the purchaser and the manufacturer of alloys will be benefited.

COPPER CONSUMPTION STILL GROWING

The steady increase in the output of copper leads us to ask again and again, where it all goes. In a general way an answer is given by a recent bulletin of the Copper and Brass Research Association compiled by Bertram B. Caddle, assistant to the manager of that association.

There is scarcely a basic industry in the world that is not a large user of copper or its alloys, and as industry grows, copper must grow with it. In 1924, 102,000,000 more pounds of copper were used in the United States than in 1920.

The largest individual consumer of copper is the electrical industry. It takes about 70 per cent of the world's output in electrical circuits, either in the machinery itself or externally as a power carrier, and in telephone and telegraph circuits either as copper or alloys. The telephone and telegraph industry takes about 200,000,000 pounds annually. The automobile industry consumes about the same amount in the form of copper, brass or bronze for use in radiator screens, oil screens, cocks, bearings, tubing, liners, connecting rod pins, bushings, nuts and screws, carburetor, hub caps, lock plates and handles, radiators, hinges, wiring, valves, oil pipes, lamps, starting and lighting generators and motors. In the street railways, the average city electric car contains from 1,000 to 2,500 pounds of copper. The building industry is rapidly increasing its quota by using more copper and brass in the form of leaders, gutters, down spouts and piping. The construction of the Grand Central Station in New York City used over 2,700,000 pounds; the Equitable Building, almost 2,000,000 pounds. Steam railroads use great quantities of copper, and as the electrification of the railroads goes on, more and more copper will be used. Add to this the tonnages that go into marine construction and the thousand and one uses, comparatively small consumers, but nevertheless not unimportant, such as fire extinguishers, cash registers, agricultural machinery, coinage, radio, condensers, dairies and copper bearing steel, and we have a fairly good idea of the reason why about 1,750,000,000 pounds of copper could be produced and sold in the United States in 1924.

Nor is the domestic market the only outlet, important as it is. Germany's consumption of copper during the first half of 1925 averaged 42,000,000 pounds monthly against only 15,000,000 pounds a year ago. It is stated in Commerce Reports that predictions have been made of a total consumption of copper by Germany in 1925 of 600,000,000 pounds; the pre-war figure was 580,000,000. The South American market is of growing importance. According to a circular of the Department of Commerce (the first two parts of which were discussed editorially in our November issue) Argentina, Bolivia, Nicaragua, Venezuela and Cuba are good markets for finished goods. Some of these states have copper deposits but mining is comparatively limited at the present time. None of them however, do any fabricating and attractive markets are there.

New metals and alloys come and go, and although once in a long period we may see a great development, like that of aluminum, the expansion of industry is sufficient to take care of both the newcomer and the old standby. Copper and its alloys are subject to attack by the new steels as well as aluminum and other metals, but they will doubtless hold a satisfactory place in industry.

METROPOLITAN IRON AND METALS

The United States Census of Manufactures for 1923 has been analyzed by the Merchants Association of New York, and New York City's industries classified. Unfortunately, the classification is such that it is practically impossible to segregate iron from metals, so the two have to be considered together. Other lines are designated which are closely allied to metals but which include a large quantity of outside materials, such as chemicals and jewelry. The combined metal industries ranks fourth in the list of manufactures with a total of 1938 establishments and over 70,000 wage earners turning out annually, products to a total of $377,000,000. Metal factories averaged about 36 workers per plant, much more than any of the other divisions.

To those who have business connections in this locality the itemized figures will be decidedly interesting. Brass, bronze and copper products lead the purely non-ferrous group with 115 establishments, 4,500 wage earners and $25,000,000 in products. Gas and electric fixtures have

105 establishments, 3,800 wage earners and $21,000,000 in products. Other specialties are listed as follows:

	ESTAB-LISH-MENTS	WAGE EARNERS	VALUE
Stamped and enameled ware.......	43	4,133	$18,170,307
Copper, tin and sheet iron work...	238	2,800	17,663,053
Stereotyping and electrotyping.....	28	1,009	5,497,366
Plated ware	25	948	4,693,679
Electroplating	78	535	2,070,338
Cleaning and polishing preparations	31	426	4,629,448
Enameling and japanning..........	10	65	342,616

Trades either allied to or contributing to metals are listed as follows:

	ESTAB-LISH-MENTS	WAGE EARNERS	VALUE
Foundry and machine shop products	448	16,349	$81,432,339
Electrical machinery, apparatus and supplies	164	8,546	54,325,167
Tinware, not elsewhere classified...	40	3,359	17,653,032
Instruments, professional and scientific	66	1,987	13,896,618
Cutlery and edge tools.............	15	1,235	9,389,212
Hardware	43	1,746	7,226,741
Steam fittings and steam and hot water heating apparatus.......	10	592	3,885,886
Typewriters and supplies..........	17	349	3,342,401
Stoves and appliances, gas and oil..	13	305	2,419,377
Engraving, chasing, etching and die-sinking	68	623	2,330,665
Aircraft and parts.................	5	514	2,016,258
Pens, gold	10	306	1,546,093
Glue and gelatine	6	111	1,355,363

It is noteworthy that in the metal industries the output per worker per year amounted to $5,340. In chemicals, paints, and drugs and allied lines the output was $14,338 and in jewelry, $9,926.

CO-OPERATIVE PLATING RESEARCH

For several years, the Bureau of Standards has carried on investigations into electro-deposition to meet the needs of the various Government Departments. The War and Navy Departments needed general electro-plating help; the Coast Survey and Hydrographic Office needed copper plated maps, and the Bureau of Engraving and Printing needed printing plates. Consequently the Bureau of Standards worked on these problems, financed of course, by the Government. In addition, however, the Bureau investigated various phases of electro-deposition which were not immediately needed for the Government. Most of this work centered on nickel and one of the outstanding results was the development of the method of controlling acidity by pH measurement. The results of the work have been published in the Monthly Review of the American Electro-Platers' Society, the Transactions of the American Electrochemical Society, circulars of the Bureau of Standards, THE METAL INDUSTRY, and other technical journals.

Necessarily, this outside work was limited because of the lack of available funds. Retrenchment is the policy at Washington and sensible retrenchment meets with everyone's approval. However, there is a crying need for investigation of the type for which the Bureau is best fitted to carry on into zinc, cadmium and chromium. No other body is equipped or staffed as well as the Bureau to investigate fundamental reactions and broad problems. Especially in the plating industry it is true that individual firms, if they can afford to attempt research at all, must confine themselves to their specialized practical problems. If successful, these researches are of use only to the company which carries them on. Naturally they do not publish results and the industry as a whole does not benefit except in a very indirect way. Consequently, the Bureau of Standards and the American Electro-Platers' Society have formulated a plan similar to that used by other industrial organizations, such as the Portland Cement Association and the International Association of Electrotypers, to provide funds and employ research associates to conduct studies at the Bureau of Standards.

The American Electro-Platers' Society is however, not literally a trade organization; it is an educational society composed principally of foremen electro-platers. It does, at the present time, co-operate with the Bureau through a Research Committee, but by its very nature it is not strong enough to finance investigations unaided, at the bureau.

For that reason it has been decided that the Society should serve as a channel through which interested manufacturers can contribute to the support of research work on plating. A definite plan has been outlined whereby an attempt will be made to get 200 manufacturers to contribute $50 each per year for three years. These funds will be held in trust by the American Electro-Platers' Society and will be expended only for the salaries and expenses of the persons engaged in this work at the Bureau of Standards. Results will be made public, and manufacturers will have the opportunity to discuss the work and plans at annual conferences at the Bureau of Standards.

It is important that these last points be emphasized. Funds contributed will be used only for salaries and expenses of the workers at the Bureau. There will be no organization expenses or other drains. These electroplating chemists will work along the lines laid out by the joint conferences of the U. S. Bureau of Standards and the American Electro-Platers' Society Research Committee as well as representatives of the manufacturers who are interested in this plan.

This is the culmination of the step taken at the July 1925 convention of the American Electro-Platers' Society in Montreal. The plan is obviously sound and almost incredibly inexpensive. We are confident that there will be no difficulty in getting 200 firms to contribute such a small sum as $50 per year. We urge our readers to communicate at once with F. J. Hanlon, Chairman of the Research Committee, 216 North Jefferson Street, Chicago, Ill., who will be glad to supply any additional information desired.

GOVERNMENT PUBLICATIONS

Arsenic in 1924. By V. C. Heikes and G. F. Loughlin. Published by Bureau of Mines, Washington, D. C.

Fluorspar and Cryolite in 1924. By Hubert W. Davis. Published by Bureau of Mines, Washington, D. C.

Platinum and Allied Metals in 1924. By James M. Hill, Published by the Burnea of Mines, Washington, D. C.

A 1925 Review of the Department of the Interior, by Hubert Work, Secretary, Department of the Interior, Washington, D. C.

Smelting and Refining Non-Ferrous Metals. Census of Manufactures, 1923. Department of Commerce, Washington, D. C.

Magnesium and Its Compounds in 1924. By J. M. Hill and G. F. Loughlin. Published by the Bureau of Mines, Washington, D. C.

Machinery, Machine Tools, Textile Machinery and Parts. Census of Manufactures, 1923. Department of Cemmerce Washington, D. C.

Colored Cotton Rags for Wiping Machinery (Sterilized). Federal Specifications, Specification No. 259. Circular No. 261. Bureau of Standards, Washington, D. C.

Rubber Packings and Gaskets (Molded, Sheet and Strip). Federal Specifications Board, Specification No. 111a. Circular No. 235. Bureau of Standards, Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { WILLIAM J. REARDON, Foundry / JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical. CHARLES H. PROCTOR, Plating-Chemical / WILLIAM J. PETTIS, Rolling Mill

CADMIUM PLATE

Q.—Please let us know where we can obtain information on cadmium, particularly in reference to sources of supply and whether the method of extracting might be such as to promise lower prices in years to come.

A.—In THE METAL INDUSTRY for December 1911 will be found an article by E. Blassett entitled Electrodeposition of Cadmium. This article established "prior art" although it was antedated by the patent granted to Russell & Woolrich in 1849. Although there are several patents covering the electro-deposition of cadmium, primarily specific patents dealing with addition agents and heating the cadmium plated surface after plating, it is said that satisfactory results can be obtained from the deposition of cadmium and mercury 99½% cadmium; ½% mercury. This method is patented by the Roessler & Hasslacher Chemical Company, 709 Sixth avenue, New York.

The other patents are controlled by the Udylite Process Company and the Graselli Chemical Company. Based upon the prior art established by Blassett, you can use the following solution without danger of any infringements:

Water	1 gallon
Sodium cyanide 96-98%	7 ozs.
Cadmium oxide 87% metal	3 ozs.
Caustic potash	1 oz.

Temperature, normal to 110° F. Voltage 4 to 5; anodes cadmium metal, backed up with sheet steel twice the surface area of the cadmium anodes. The upkeep of the cadmium solution is practically the same as any other cyanide solution. If the solution is in operation constantly through the day, the addition of ⅛ oz. sodium cyanide per gallon per day with 1/64 oz. caustic soda will keep up anode reduction and cathode deposition. The original water-line should be constantly maintained with clean, fresh water. If there is considerable drag out from the solution, which means everything that the solution contains, then the drag out must be replaced on the original basis.

You can locate cadmium metal and cadmium oxide through the advertising columns of THE METAL INDUSTRY. The operation of the solution and the cleansing of the product before plating, etc., are the same as for any other plating solution. Greater production and foreign importations should bring about lower prices in the future.—C. H. P. Problem 3,464.

CONTAMINATED NICKEL SOLUTION

Q.—Will you please tell me the best way to get copper out of a nickel solution without removing the solution? The copper got into the nickel, copper hooks on the anodes and copper and brass castings falling into the tank. My background of the work is black.

A.—Contaminating nickel solutions with even minute amounts of copper is detrimental to the solution. The results are dark, smoky deposits of nickel. Use nickel or steel hooks to support your nickel anodes. The simplest and probably the most effective method to remove the copper from the nickel solution is as follows:

1. Add muriatic acid to the solution up to ¼ oz. per gallon, then stir thoroughly into the solution.

2. Get a quantity of scrap sheet steel. If possible, it should be free from grease and rust. Hang the scrap steel on the work pole and then let the steel remain in the solution all night. The copper will deposit upon the steel if the solutions contains sufficient free acid. The method can be repeated several times or until the nickel becomes white again. The free acid can be neutralized if detrimental to your nickel deposits, with one-eighth ounce per gallon of aqua ammonia 26°.—C. H. P., Problem, 3,465.

GUN METAL FINISH

Q.—Would like to know if there is an acid to gun metal rifles or pistols. Over in France, the Germans applied some kind of a liquid right on those shiny spots. I would like to know what that solution was, as it is quick and no labor involved. As I have occasion where this solution would come in handy for old and used guns.

A.—There are several methods by which a gun metal finish can be produced on rifles or pistols. However, the old finish must be previously removed by polishing down with fine emery cloth and cleaned with benzole or gasoline. Either of the following mixtures can be used and applied to the surface to be gun metal finished, with a small sponge which should not be excessively wet.

Water	1 pint
Denatured alcohol	1 pint
Chloride of iron crystals	2 ozs.

Dissolve the iron salt in the water, which should be warm, then add the alcohol; mix thoroughly and the solution is ready for use.

Water	1 quart
Copper sulphate	⅛ oz.
Muriatic acid	⅛ oz.
Chloride of iron	5 ozs.
Nitric acid	½ oz.

Mix the solution in the order given and apply to the rifles or pistols as mentioned. After applying either of the mixtures to the rifles or pistols, they should be placed in a position above boiling hot water so that the steam comes in contact with them for 30 minutes or more, or until they are coated with a heavy rust. Then immerse them in boiling water and afterwards let them dry. Remove the rust afterwards by scratch brushing with a steel wire brush, or rub down with fine steel wool. A blue-black color will result. Wipe down with a cloth moistened with linseed oil and then let the oil dry.

The method you mention might, however, consist of the following: Mix solution of butter of antimony with olive oil to a creamy consistency; then heat the rifle or pistol and apply with a woolen cloth. Let the articles stand for 12 to 24 hours, then repeat. After the expiration of the second period, wipe the surface dry, then rub down with a little beeswax and turpentine paste and polish with a soft cloth.—C. H. P., Problem 3,466.

OLD NICKEL SOLUTION

Q.—I would like to ask you what I could do with an old double nickel solution about 90 gallons which has not been used for about one year. It was alkaline and stood 8° Baumé. I tried to plate several hundred small steel pieces, ¾" x 4" x .036 in a mechanical plater, but after 2 hours with about 4 volts, it came out very black and with no deposit. I then added about 2 lbs. of boracic but that made it no better. I tried about one pint of sulphuric acid; that was of no use. So I tried 2 lbs. of sal-ammoniac and then built it up with 15 lbs. of double nickel salts and 3 lbs. of single nickel salts until it then stood 10° Baumé and tried that and it was still dark, so I boiled the solution for about one hour and it stood for two days, and filtered it back. It was no better. So I tried about 1 pint of ammonia and now with 6 volts it comes out very much whiter, but a very thin deposit which peels and is hard. I have used this solution before and it worked. The solution is not used very regularly.

A.—We suggest that you add 25 pounds of Epsom salts to your nickel solution that you have tried to bring back to normal by several additions of various factors.

If this addition does not bring the solution back with a voltage of not less than 8 volts (4 volts are of no value in mechanical barrel plating), add from 2 to 4 ozs. of single nickel salts per gallon of solution. If peeling still results, although the nickel may be a white color, then add half a pint or more of hydrogen peroxide, such as may be purchased in any drug store.

The hydrogen peroxide will neutralize the hydrogen and produce a malleable nickel that will not peel. We believe these additions will give you a good nickel deposit. Try 8 volts pressure before making any additions. Four volts are of no value.—C. H. P., Problem 3,467.

MOLDING SAND

Q.—What standard grades of molding sand are best suited for making: Bronze castings (lead 15%); phosphor bronze castings (phosphorus 0.5%)?

A.—The standard grade of molding sand we would suggest for bronze castings containing 15% lead and phosphor bronze containing 0.5% phosphorus and 88-10-2, is the No. 2 Albany or its equivalent. We suggest you face the mold with a mixture of 30 parts No. 2 Albany, ¼ new and ¾ old and one part pitch compound. This stops the cutting due to the high lead or the phosphor.—W. J. R., Problem 3,468.

POLISHING AUTO REFLECTORS

Q.—Would like to ask you for information on the best method of polishing auto reflectors previous to nickeling. What type or style polishing wheel is used for reflectors? Would like to know what process the big manufacturers use. About what is the greatest production per hour of an automatic polishing machine?

A.—Most firms are now making the reflectors from sheet brass, so emery polishing is avoided. They do, however, cut down with emery paste and cloth buffs of the sewed type. Following the emery paste operation, the reflectors are cut down to a smooth finish with Tripoli composition and regular cloth buffs.

The entire polishing and buffing operations, except color buffing after silver plating, are done by automatic buffing machines, the reflectors being held in cast-iron chucks by vacuum. One man operates two automatic buffing machines and the time for the operations is considerably less than one minute, so not less than 200 reflectors are polished in one minute.

Steel reflectors are polished automatically in two operations, using 100 and 180 emery. The polishing wheels are cone shaped to conform to the shape of the reflector, made of sewed buffs and emery coated. The polishing medium is Tripoli and emery paste. The reflectors when made of steel are copper plated in hot copper cyanide solutions; afterwards color buffed, cleansed and nickel plated for two minutes in a bright nickel solution; then silver plated in a silver solution high in free cyanide, which strikes and plates inside of half a minute. The final color buffing is done by the aid of Canton flannel buffs and lamp black, kerosene oil and denatured alcohol. When brass is used as the metal for the reflectors, naturally copper plating is dispensed with. The figures we have given as 200 per man per hour may be exceeded in some instances.—C. H. P., Problem 3,469.

POOR COPPER PLATE

Q.—I am having considerable trouble with my cold copper solution. When I plate shells or bumpers for automobiles, they come out spotty and sometimes peel or blister. My anodes when plating contain a black scum; when not plating they always have a black scum. I have put in cyanide of copper, cyanide of sodium and the conducting salts, soda ash. After copper plating some of my work, I nickel plate the same and in places the nickel peels.

A.—Your difficulty in copper plating is presumably due to the excessive deposition of hydrogen with the copper deposit. As a remedy for the condition, first add ½ oz. caustic soda, then 1 oz. bisulphite of soda per gallon of copper solution. Then follow up with an addition of sodium cyanide 96-98—½ to 1 oz. per gallon. These additions will remedy your trouble, due to the peeling of the copper deposit. Evidently you do not use enough sodium cyanide in your solution. Add more for better results.

If you experience any trouble due to the nickel peeling from the copper will deposit upon the steel if the solution contains suftion, then add 1/15 oz. sodium perborate per gallon. Dissolve the total amount required in warm water until completely dissolved (about 1 lb. to 5 gallons of warm water are about the right proportions). Add pure muriatic to the sodium perborate solution until it becomes very slightly acid to blue litmus paper test, or equal to the acidity of your nickel solution. With these additions you will have better solutions than you now have.—C. H. P. Problem 3,470.

RE-SILVERING MIRRORS

Q.—I am a constant reader of your magazine and would like to get some information on how to re-silver old mirrors as I want to take this up as a side line.

A.—For detailed information covering the re-silvering of mirrors, see article by C. H. Proctor in THE METAL INDUSTRY, May 1923, page 193.—C. H. P., Problem 3,471.

SHERARDIZING MALLEABLE IRON

Q.—We are desirous of sherardizing malleable castings weighing one half pound and one pound. Will you tell us something of this process?

A.—Briefly the sherardizing process consists of depositing zinc on iron and steel and other metal surfaces melting at a higher temperature than zinc. The process is a vaporizing method and can be carried out as follows:

1. Secure a steel cylinder not less than ⅛ inch in thickness and of suitable length and circumference. The steel cylinder should be made so that both ends can be closed hermetically tight so that the vaporizing gases cannot escape.

2. The product to be sherardized must be clean and free from greases, scale or rust when placed in the cylinder. The factor for the zinc coating is a good grade of fine zinc dust. Pack as many articles in the cylinder that it will hold with a plentiful supply of zinc dust.

3. Heat the cylinder in a retort or muffle to 730° F., the vaporizing temperature, for one or two hours. Then remove and let the cylinder cool down to normal temperature. The product will be found uniformly coated with zinc or sherardized. The zinc dust can be used over and over again with an addition of a little new zinc dust. Gas is the most desirable heating medium. Experiment with one or two pieces of castings first to get your bearings. A little practice will give you the results you desire. —C. H. P., Problem 3,472.

TIN PLATING

Q.—Can you inform me on solution, anodes and general methods used in tin plating copper and brass trays? Trays are about nine inches long by four inches wide and two inches deep and made of .031 sheet copper or brass.

A.—One of the best formulae for electro-tinning is the following:

Water	1 gallon
Sodium stannate	28 ozs.
Soluble tin salt	4 ozs.
Powdered yellow rosin	⅛ oz.

Anodes, pure Straits tin. Temperature of solution 180° F. Voltage 3 to 4.

You can plate any metal such as steel, iron, brass or copper with this solution under regular plating conditions. You can locate the necessary materials through advertisers in THE METAL INDUSTRY.—C. H. P., Problem 3,473.

TREEING NICKEL PLATE

Q.—Please tell us what causes a nickel solution to tree, also what can be used to prevent same.

A.—Evidently you are using excessive voltage. In nickel plating, high voltages would result in treeing of the nickel deposit. Possibly your nickel solution has a high internal resistance which may necessitate the use of high voltage. If this is true, then add 1 oz. sal-ammoniac per gallon of solution and ⅛ oz. pure muriatic acid. Add 1/15 oz. per gallon of sodium perborate, the total amount to be used to be dissolved in hot water before adding to the nickel solution. We believe these additions will remedy your trouble of treeing. The voltage for a still nickel solution should not exceed 4 volts. For mechanical solutions, 8 volts or more are permissible. If the voltage required is still high, then one more ounce of sal-ammoniac can be safely added per gallon of solution. —C. H. P., Problem 3,474.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,553,298. September 8, 1925. **Light-Metal-Casting Alloy.** Edward C. Burdick, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

As a new product, a light metal alloy containing not less than 80 per cent and not more than 99.5 per cent of magnesium, together with a trace, measured in tenths of one per cent of iron.

1,554,080. September 15, 1925. **Process of Refining Alloys.** Walter Friedrich, Niederschoneweide, Germany, assignor to General Electric Company, a corporation of New York.

The process of refining alloys of copper and aluminum which consists in treating said alloys in a fluid state with an alkali compound.

1,554,097. September 15, 1925. **Process of Plating Spooled Metal Bands with Spooled Bands of Another Metal.** Franz Jordan, Wickede-Ruhr, Germany.

A method of plating metal bands which consists in the steps of spooling each metal band separately; heating the spooled metal bands; rolling said bands together; and rolling the band thus formed at welding heat.

1,554,168. September 15, 1925. **Plating Apparatus.** Winthrop W. Benner, Akron, Ohio, assignor to Firestone Tire & Rubber Company, Akron, Ohio.

An apparatus for electroplating annular objects, a continuously moving conveyor, hooks upon the conveyor from which the articles are suspended in an electroplating bath, and a device for engaging the upper part of an object and holding it for a period sufficient to cause it to drag over the hook to a new position.

1,557,025. October 13, 1925. **Nickel-Chromium Alloy and Articles Made Therefrom.** William F. Cochrane, Baltimore, Md., assignor, by mesne assignments, to U. S. Industrial Alcohol Company, a Corporation of West Virginia.

An alloy which comprises chromium 1% to 5%, nickel, 20% to 40%, and the balance largely copper.

1,557,004. October 13, 1925. **Nickel-Copper Alloy.** Walter F. Graham, Baltimore, Md., assignor by mesne assignments, to U. S. Industrial Alcohol Companay, a Corporation of West Virginia.

An alloy consisting of nickel 30 to 35%, iron 3 to 7%, and the remainder copper, and containing no lead or zinc.

1,557,431. October 13, 1925. **Gold Alloy and Method of Making the Same.** Victor D. Davignon, Attleboro, Mass.

A substantially homogeneous malleable and ductile gold-copper alloy having not less than about 25% by weight of gold and a material proportion of copper and containing at least 1% by weight of aluminum.

1,557,474. October 13, 1925. **Continuous Rotary Electroplating Machine.** Harry B. Farrand, Philadelphia, Pa.

In an apparatus of the character described a vat, a series of rolls mounted within said vat, a perforated barrel supported by said rolls, a rib spirally disposed within the barrel, a worm wheel mounted upon the barrel, a worm meshing with said worm wheel for revolving the latter, a hopper adapted to receive the articles to be plated, a conveyor for elevating said articles from the hopper; a chute for conveying the articles from the conveyor to the interior of the barrel; a pocket for receiving the articles from the barrel, a conveyor for elevating the articles from said pocket; a series of anodes disposed adjacent to the barrel upon the outside thereof; a second series of anodes supported within the barrel and out of contact with the latter; and a series of flexible cathodes suspended within the barrel and arranged to lie against the interior surfaces of said barrel.

1,557,981. October 20, 1925. **Non-rusting Alloy.** Monroe S. Clawson, Upper Montclair, N. J.

A non-rusting alloy consisting of nickel 82 to 96 percent, silicon 3 to 10 percent, manganese 1 to 5 percent, chromium 1 to 5 percent, carbon .85 to 3½ percent, iron 1 to 6 percent, and copper ½ to 4 percent, together with a small proportion of reducing, deoxidizing and denitrogenizing elements.

1,558,035. October 20, 1925. **Metal-Coating Apparatus.** Edwin Ross Millring, Orange, N. J., assignor to American Machine & Foundry Company, a Corporation of New Jersey.

The combination with means for supporting a bath of molten coating-metal, of means continuously removing dross from its surface at the position where coated material emerges from said bath.

1,558,066. October 20, 1925. **Method of Making Light Metal Alloys.** William R. Veazey, Cleveland, Ohio, and Edward C. Burdick, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich.

In a method of making a light metal alloy in which magnesium largely predominates, the steps which consist in first interfusing the desired amount of the alloying metal with a relatively small quantity of magnesium, and then adding the resulting alloy to the remaining quantity of magnesium in molten state.

1,560,885. November 10, 1925. **Method of Making Alloys.** Richard Walter, Dusseldorf, Germany.

The hereinbefore described process of making alloys of silicon and heavy metals, which consists in mixing the components in proper proportion for the formation of a single homogeneous silicide, in then heating the mixture to a temperature at which exothermic reaction is initiated, and in then using this reaction to melt down the charge.

1,560,933. November 10. 1925. **Galvanizing Flux.** Umejiro Emura, Tokyo, Japan, assignor to Teiji Yamanouchi, Tokyo, Japan.

A galvanizing flux comprising ammonium chloride, a strontium bearing material, sulphur, a bismuth bearing material, and alkali metal compounds, substantially as set forth.

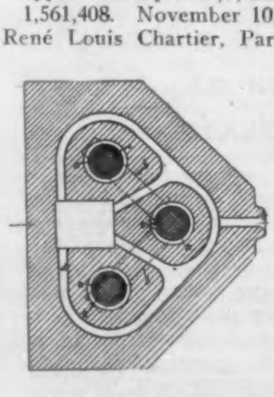
1,561,053. November 10, 1925. **Method of and Composition for Cleaning Metals.** Bruce K. Brown and Emil G. Schmidt, Terre Haute, Ind., assignor to Commercial Solvents Corporation, Terre Haute, Ind.

A composition of matter for cleaning and preserving iron surfaces, comprises an admixture of mesityl oxide, acetone, phosphoric acid, and water.

1,561,247. November 10, 1925. **Metallic Composition.** Edwin F. Kingsbury, Rutherford, N. J., assignor to Western Electric Company, Inc., New York, N. Y.

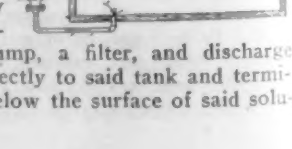
A contact alloy comprising the following metals in the following proportions by weight, gold—approximately 72%, silver—approximately 26.2%, and the remainder base metal.

1,561,408. November 10, 1925. **Induction Electric Furnace.** René Louis Chartier, Paris, France, assignor to Compagnie Francaise des Metaux, Paris France.



In a three-phase induction electric furnace comprising closed channels filled with molten metal which act as the secondary wires of induction transformers, and in which the channels form a circuit around each core of a primary, an arrangement wherein the portions of these circuits which are at the interior of the furnace are common to two contiguous circuits and have the same section as the portions of the circuits which are turned near the exterior of the furnace.

1,561,602. November 17, 1925. **Electroplating Apparatus.** Julius M. Gauss, South Bend, Ind., assignor to The Studebaker Corporation, South Bend, Ind.



In an electro-plating apparatus, a tank containing an electro-plating solution, means comprising a centrifugal pump for continually drawing off a portion of said solution, means for driving said pump, a filter, and discharge means leading from said filter directly to said tank and terminating in a horizontal direction below the surface of said solution in said tank.

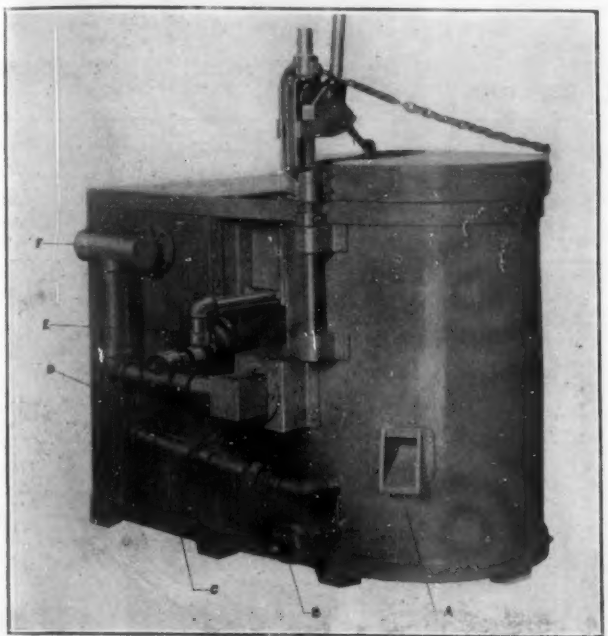
EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Recuperative Crucible Furnace

By R. S. WILE
Surface Combustion Company, New York

A new brass furnace has been recently developed and fifteen are in operation in two foundries in Newark, N. J. Eleven of these furnaces are in operation at the Gamon Meter Company, and four in the plant of the C. A. Goldsmith Company. A cut shows this installation. These furnaces are operating on city gas together



SURFACE COMBUSTION RECUPERATIVE FURNACE

A—Is the clean-out hole for metal spilled or from broken crucibles.
B—Is the cold air inlet passing under the pedestal block.
C—Is the clean-out door in the recuperator chamber. This permits the removal of dust.
D—Is the hot air valve controlling the entire combustion.
E—Is the governor for Surface Combustion low pressure system.
F—Is the hot air discharge pan recuperator which is easily brought forward to permit removal of recuperators.

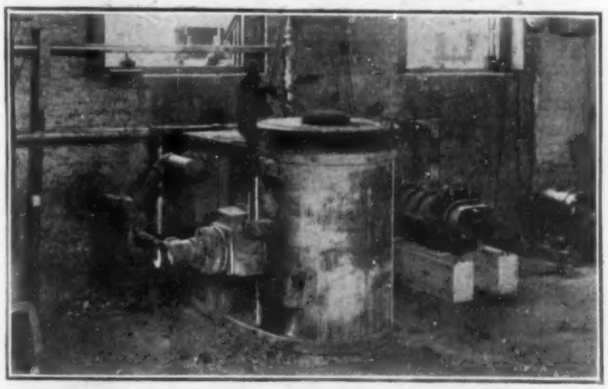
with preheated air to utilize a large portion of the heat contained in waste gases leaving the furnaces. This method of operation has several advantages, as it not only saves in fuel, but it reduces the melting time very materially and the losses are lessened as a result of the shorter time in the furnace and the reducing atmosphere maintained. If oil is used, the preheated air has the faculty of shortening the flame, which is, of course, a great advantage in crucible practice. This preheating is accomplished by recuperators.

Recuperators are metal or tile devices consisting of two series of separate passages, one of which is for the passage of hot gases and surrounds the other, which is for the counter current flow of cold air. The recuperators are housed in the rectangular section of the furnaces shown against the wall and consist of two sections each being made with four tiers. Each section is made up of one tier of heat resisting alloy and three tiers of cast iron. The cold air from the blower shown at the right enters the recuperator at the bottom and into the cast iron sections. At this point the products of combustion have been cooled to a great extent and are about to leave the recuperator chamber. The air travels into the heat resisting alloy sections and on its upward travel, meets the hot products of combustion until finally the hot air leaves the furnace by the manifold shown at the top of the recuperator chamber. In this manner the products of combustion are partially cooled of their sensible heat which the cold air absorbs through the common walls of the recuperators. The overall efficiency of the furnace to which recuperators have been applied has been increased in many cases as high as 50%.

The recuperators used and the design of the recuperator chamber make them very accessible if necessary to clean or remove them from the furnace. These sections are made of heat resisting alloy which has been found to withstand the action of the hot flue gases for a long period. Tile recuperators were not considered in the design of this furnace because of the weight and bulk and the necessity of heating the entire mass to obtain a high preheat in the incoming air.

Where metals subject to oxidation are melted, it is desirable to use and maintain a slightly reducing atmosphere. This is impossible to control with the coal or coke fire. With the "automatic proportioning" equipment, installed with these furnaces, using gas as fuel, after the adjustment has once been made, the control of the atmosphere remains fixed regardless of the rate at which the fuel is used. A single valve regulates the rate of firing with the mixing of the fuel and air and their proportioning takes place automatically and noiselessly. Using oil as fuel the regulation is slightly less certain but may be maintained within reasonable limits. This equipment is made by the Surface Combustion Company, New York.

The furnaces now being installed are equipped with the Standard Surface Combustion low pressure inspirator and burner, so designed that the hot air and gas will be automatically proportioned in the correct manner with the control of this mixture on the cold air inlet. For the proper operation air is boosted to 1½ lbs. pressure with the gas at service pressure just as it comes from the gas company mains. The air passing through the inspirator throat induces a slight suction which draws in the gas after this has been reduced to atmospheric pressure by the governor. The inspirator is designed so that the suction created is proportional to the amount of air flowing through it. The perfect mixture of gas and air is fed to the burner where combustion takes place in the refractory tunnel before the flame enters the melting chamber. The hot gases are fired tangentially to the inside lining of the furnace enveloping the crucible without direct flame impingement. The oil burner operates on the same principle but without the



INSTALLATION AT C. A. GOLDSMITH COMPANY

governor and with the air pressure between 1½ and 2 lbs. per sq. in. The design of this burner is such that only about 60% of the air is passed through the burner, the remaining 40% being induced from the atmosphere by the velocity of the air oil mixture. The temperature of the preheated air depends on the character of the brass melted and the temperature in the melting chamber. The higher the temperature required to melt the metal, the higher will be the preheat temperature of the air. When melting red

brass the preheat temperature is approximately 1000° F., but when melting yellow brass it is seldom above 900° F.

The advantages of recuperation are evident from the consideration of the fuel requirements per pound of metal melted. When melting red brass with cold air and gas, the fuel consumption is approximately 500 ft. per 100 lbs. of metal. However, with the sensible heat of the waste gases given to the incoming air the higher flame temperature reduces the fuel consumption to approximately 300 cu. ft. per 100 lbs. after the furnace has been heated to the melting temperature. The metal losses are reduced in about the same ratio. Using gas at $1 per 1000 cu. ft. the fuel cost per lb. of red brass or composition metal is about 3/10c, which is somewhat less than coal and without the added inconvenience. While a coal fire is turning out 3 heats in 8 hours, the crucible furnace will melt a charge every hour and with standby losses 7 heats during an 8 hour day or 100% increase over pit fires.

The result of a day's run of furnaces similar to those described but without the proportioning equipment are given below.

HEAT	WT. POURED	GAS	GAS/LB.	LOSS
1	227	1165	5.14	2½%
2	224	1035	4.63	2½%
3	235	960	4.08	2¾%
4	241	865	3.59	2¾%
5	231	803	3.48	2 %
6	240	796	3.32	2 %
7	232	711	3.07	2 %
Total	1630	335	3.89	2¾%

The addition of the proportioning equipment has reduced the daily average which includes the heating up and standby table losses to approximately 325 cu. ft. per 100 lbs.

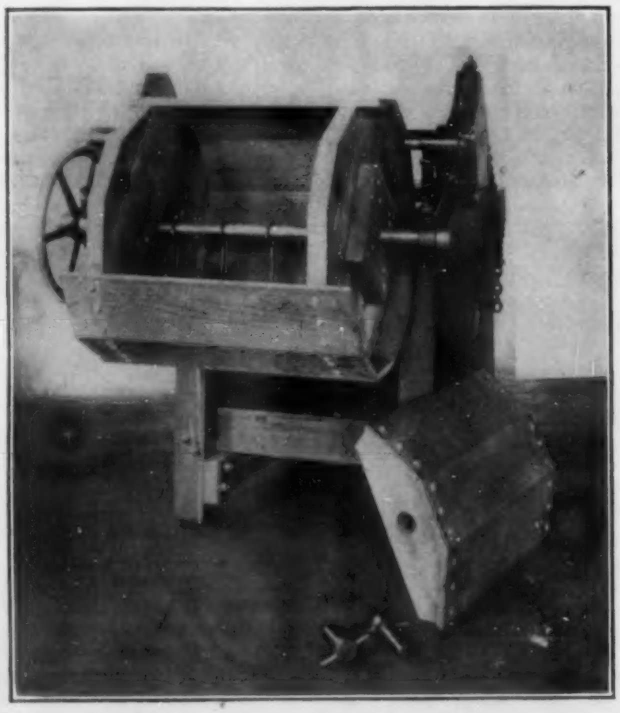
The foundry when operating on a production of 8 heats of 240 lbs. each day is obtaining a gas rate of approximately 85c per 1000 cu. ft., which represents the cost of about 25c per 100 lbs. against the previous cost of 50c per 100 lbs. for hard coal in the same plant with the same operators. Eliminating the first two heats with a cold furnace the average fuel consumption is 350 cu. ft. per 100 lbs. of brass poured.

NEW PLATING BARREL

When P. G. Purinton took the position of superintendent of the Patent Button Company, Waterbury, Conn., five years ago, a considerable amount of trouble was being experienced in the plating department, due to lack of plating equipment and lack of space for any additional equipment. Also, there were as a rule one or two plating barrels always out of commission on account of leaky tanks, breakage of hardware, plating of hardware below the solution level and disintegration of the barrels.

Finally, Mr. Purinton designed and patented the machine which has become standard at the Patent Button Company and some neighboring concerns have adopted it.

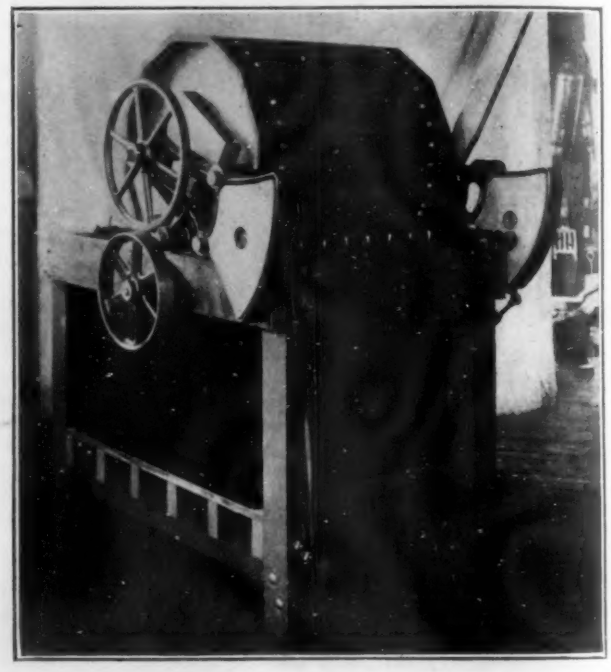
Permanence has been stressed in every detail of construction, and, as the illustration shows, it is unique in many respects. The usual wooden tank has been replaced by an open framework of fir (much cheaper than cypress), enclosing a welded sheet iron tank, lined with lead for nickel plating, but without lining for cyanide solutions. The upper end of the anode, instead of having



DISCHARGING AND RELOADING POSITION

a hook cast into it, is curved for clamping permanently onto a brass bar. There are fourteen anodes on each side of the barrel, giving a high ratio of anode surface.

The barrel frame has a set of three trunnions on each side, the two cross bars each acting as a pair of trunnions, and the third pair is shown in place in the trunnion socket castings on top of the wooden frame. The two side arms of the barrel frame are counterweighted, so that the center of gravity of the barrel and frame



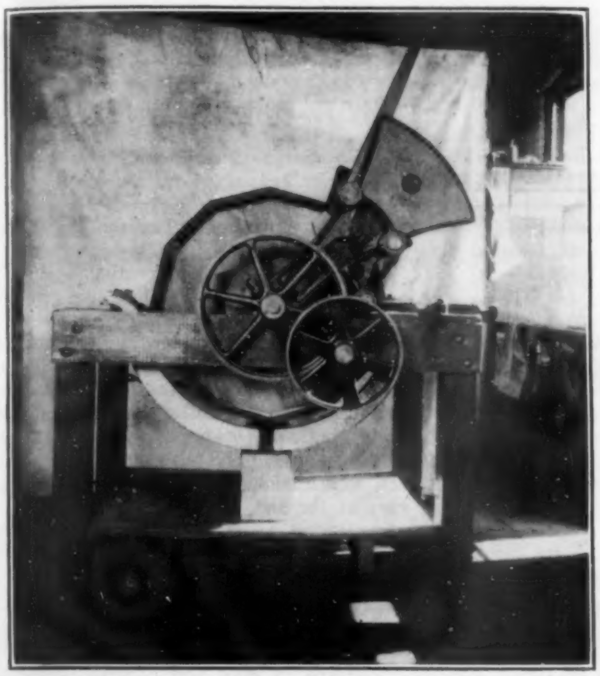
DRAINING POSITION

assembly always come between two pairs of supporting trunnions, with any amount of work to be plated in the barrel up to 175 pounds.

The barrel assembly may be stepped along successively, with the aid of the wooden handle, from the plating position to the draining position, and then to the discharging and reloading position, the latter being out in front of the tank. The barrel assembly is stable in any of these three positions and the entire operation can be performed very rapidly by one man. No countershaft, switch or hoist is needed with this machine. The gear on the barrel shaft is carried out of mesh with the driving pinion when the barrel is stepped to its draining position, and the circuit is broken at the same time, for when the barrel leaves the plating position, the barrel shaft leaves the two bearings through which the current to the work is supplied.

Conversely, when the reloaded barrel is stepped back into the plating position, the electrical circuit is completed automatically and the rotation of the barrel automatically started. The machine has a high electrical efficiency because the only metal in the solu-

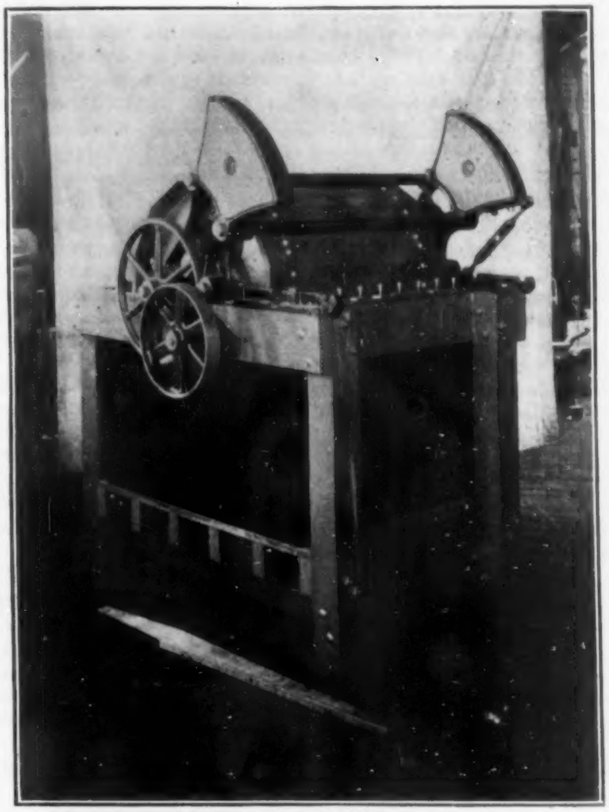
tion which can be plated is the work inside the barrel and the ends of the danglers in contact with the work. The barrel shaft is just above the solution level and the panels of the barrel are fastened on with wooden pins, and the barrel cover, consisting of four panels, is held in place with large, hard rubber dowels, fitting in hard rubber bushings.



RELATION OF ANODES TO BARREL (TANK REMOVED)

The machine is no more expensive than the average machine now on the market. The extra expense in the tank, the hardware and barrel is just about offset by the elimination of the countershaft, switch and hoist. Where it really excels is in low upkeep cost, long life, high production for the floor space occupied and low labor cost for operating.

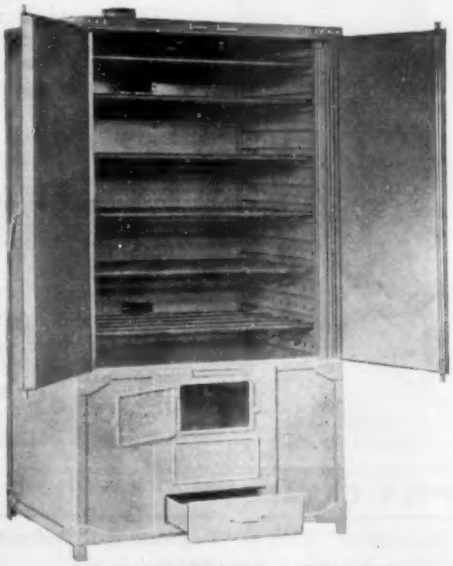
This machine has not been placed on the market, but Mr. Purinton is prepared to supply the equipment, and inquiries may be sent to him, care of the Patent Button Company, Waterbury, Conn.



PLATING POSITION

PORTABLE CORE OVEN

Frederic B. Stevens, Inc., of Detroit, Mich., is marketing a new, all-steel portable core oven. It was designed to take care of rush jobs and smaller cores.



STEVENS PORTABLE CORE OVEN

The oven has adjustable shelves to take care of various sized cores. The sides — top — bottom and doors are steel panels with insulation 1½" thick. Proper insulation reduces fuel consumption and baking time.

The fire box complete with the baffle plate is made entirely of cast iron. The fire box is 18" by 17" by 15" deep, and the fire needs attention only once or twice daily. All fire box parts and grates can be replaced very quickly and with very little expense. The ash pan below the fire box measures 24" long by 17" wide by 4" deep and is pulled out as shown in the illustration to increase the draft, or closed to reduce the draft. Incidentally the pan is of ample size to take care of all the ashes that may accumulate during a day's run.

There are two outlets to the smoke pipe. To get a quick fire the lower outlet is closed by means of a damper at the rear of the oven. After the fire is going properly, the upper draft or damper is closed and the bottom one opened so that the greatest efficiency is obtained.

STANDARD SPECIFICATIONS No. 37 CORE OVEN

Overall dimensions—37" wide, 35" deep, 82" high.
Baking space—29" wide, 31" deep, 50" high.
Shipping weight—1400 lbs.
Net weight—1300 lbs.

The No. 37 Oven is furnished with 16 shelf supports with 3" between centers. Six sets of pipe shelf as shown in cut are furnished with each oven.

Each shelf has 6¼ sq. ft. of surface.

With shelves on each of the 16 supports, the oven has 100 sq. ft. of shelf surface.

With shelves on every other support, giving 6" between centers, the oven will have eight shelves and 50 sq. ft. of shelf surface.

With the shelves on every third support, giving 9" between centers, the oven will have five shelves and 33⅓ sq. ft. of shelf surface.

CORRECTION

In our November issue, in the article describing the Roche Ideal Balancer, the address of the manufacturer was given as Detroit, Mich. This was an error. The manufacturer is the Roche Ideal Balancer Company of Battle Creek, Mich. The inventor of the Balancer is John Roche.

ELECTRIC HOIST

The Northern Engineering Works, of Detroit, Mich., builders of Northern "Standart-ized" Cranes and Hoists, have recently announced a new member of their Electric Hoist family, known as the Northern "Standart-ized Hi-Lift."

This new hoist embodies all the essential features included in the Standart-ized five ton crane design, which has been one of the company's biggest sellers. The design of the hoist is said to meet all the up-to-date features and requirements, including simplicity, accessibility, extremely high lift, a feature regarded as most essential in the present day application of electric hoists; completely enclosed gears running in lubrication, and gears made of hammered steel and case hardened. The drum, which is of large diameter, is of the grooved type.

The hoist is provided with two brakes for holding and controlling the load, a top and bottom limit stop, roller bearings throughout. One especially outstanding feature of the construction provides that any standard make of motor can be applied to the hoist.

ALUMINUM GRAPHITE PAINT

The Joseph Dixon Crucible Company, Jersey City, N. J., announce the addition of an aluminum graphite paint to their paint line. This paint is made to meet the special requirements primarily of all gas companies, oil companies, steamship and industrial companies, greenhouse owners, pipe lines, municipalities, sugar companies and in fact wherever an aluminum paint or light colored paint is required. It is recommended by the manufacturer for gas holder, oil tanks and in fact all exposed metal work.

It is composed of aluminum combined with the flake silica-graphite pigment and boiled linseed oil. Aluminum, when used for paint making, is of flake formation and when combined with the Dixon pigment, each flake laps over, after the manner of fish-scales, it is claimed, forming a covering of great elasticity and durability. In other words, the scales overlap one another (as in their regular Dixon's Silica-Graphite Paint) so closely that nothing can penetrate to the under or painted surface.

Its lustre is slightly less than a straight aluminum paint, but it is pleasing to the eye.

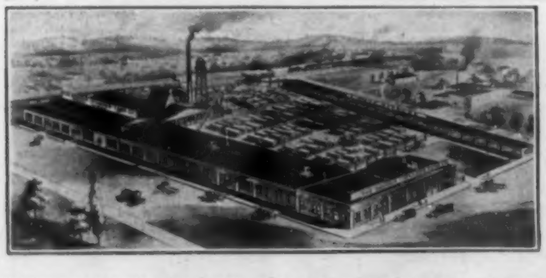
Gases, fumes, acids, smokes and other deteriorating agents, it is stated, will have little if any effect on Dixon's aluminum-graphite paint. It will retain its color after light colored paints have darkened. It will resist the natural enemies of paint—sunlight, air and moisture. It reflects light and heat, which will make it an industrial paint of great value. It will stain less from soot, dust, water, etc. When used on oil storage tanks, it will keep the temperature of the contained oil 10° lower than that of oil in tanks painted with dark color paints. This also applies to refrigerator cars and tank cars, where coolness is desired, even though exposed to the direct rays of the sun.

It can be sprayed or brushed on. The Dixon Company recommends the latter method. It can be brushed on over a dark coat of paint, one coat being sufficient to cover the under surface.

TANK COMPANY'S NEW PLANT

The Hauser-Stander Tank Company, Cincinnati, Ohio, has recently moved into a new plant at Winton Place. This plant covers over four acres and is devoted to the manufacture of wood tanks exclusively. This company has been in this business for more than fifty years, building wood tanks for every purpose.

Rubber-lined, lead-lined, copper-lined tanks, etc., as well as agitators of various designs and other chemical tank equipment, are also manufactured by this concern. Many new tanks for special purposes have been developed to meet certain specific requirements. An engineering and chemical department is maintained to assist customers in solving their problems and make recommendations as to the proper wood to use and the kind of construction required for special purposes.



NEW HAUSER-STANDER PLANT, CINCINNATI, OHIO

A rigid system of inspection is maintained and all tanks shipped whole are tested before leaving the factory. Loading docks, inside the building, are provided for loading local shipments, and two railroad cars can be loaded, inside the building, for out-of-town deliveries. This railroad track is depressed so that the floor of the factory is level with the railroad car floor.

The main factory and office buildings are 120 ft. wide and 400 ft. long. The buildings are of steel and concrete fireproof construction, with faced brick outside. Windows on all sides provide ample light.

Some of the industries served are the platers, chemical manufacturers, acid manufacturers, electrotypers, enamelers, galvanizers, etchers, automobile manufacturers, etc.

A cordial invitation to visit this new plant is extended to all interested.

ZIG ZAG SAND SIFTERS

ZIG-ZAG SAND SIFTER

The Ruemelin Zig Zag Sand Sifter is claimed to be a strong, sturdy and durable outfit for removing dust from sand.

Used sand is shoveled into the hopper. At the bottom of the hopper is an adjustable door to regulate the flow of sand and distribute it evenly across the top of the sifter screen. The Zig Zag bars perform the same duty as a revolving screen so that all dust is removed from used sand without any labor. The screen is adjustable to take care of any kind of sand or abrasive.

It is a well known fact that if sand contains 30% of dust it requires 5 times as long to sand blast a job and requires 5 times as many nozzles as compared to clean sand.

This sand sifter is made by the Ruemelin Manufacturing Company, Minneapolis, Minn.

EQUIPMENT AND SUPPLY CATALOGS

Core Ovens. The Swartwout Company, Cleveland, Ohio.

Water Softening. National Lime Association, Washington, D. C.

Direct Fired Heaters. American Blower Company, Detroit, Mich.

Metal Melting Furnaces. Campbell-Hausfeld Company, Harrison, Ohio.

Automatic Voltage Regulators. Bulletin No. GEA-123. General Electric Company.

Universal Riddle. A riddle for foundry sands. Frederic B. Stevens, Inc., Detroit, Mich.

Forging Machinery. Exhibit at the Second Exposition of National Forging Machinery of the National Machinery Company, Tiffin, Ohio.

Electric Steam Turbines. Bulletin GEA-235. General Electric Company, Schenectady, N. Y.

Methods of Handling Salesmen's Expenses. Metropolitan Life Insurance Company, New York.

Properties and Plants of Bethlehem Steel Corporation. Bethlehem Steel Corporation, New York.

Instrument Transformers. Bulletin GEA-178. General Electric Company, Schenectady, N. Y.

Mechanical Motion and Electrical Operation Recorders. The Bristol Company, Waterbury, Conn.

"Finish Sells Goods." A folder on electro-galvanizing from the Meaker Galvanizing Company, Chicago, Ill.

Nickolite. A white nickel silver for plumbing fittings. Whipple & Choate Company, Bridgeport, Conn.

Electro-Chemical Deposition of Metals, including electrochemical deposition on aluminum. A guide for engineers, works chemists, instrument makers and all users of plant and machinery. Fescol, Limited, London, England.

Meakerite and Brightening Salts. Chemicals for use in electro-galvanizing. Meaker Galvanizing Company, Chicago, Ill.

A Historical Sketch of Bridgeport Brass Company. Reprint of the article published in the August, 1925, issue of THE METAL INDUSTRY. This reprint also includes the article on Brass Manufacturing Progress by W. R. Clark, published in THE METAL INDUSTRY for April, 1925.

Chemicals. Full line of products and the properties of these products, made by the Commercial Solvents Corporation, Terre Haute, Ind. These products are as follows: acetone, U. S. P.; butanol (butyl alcohol, normal); butalyde (butyl aldehyde, normal); dibutyl phthalate; dibutyl tartrate; diacetone alcohol; ethyl alcohol, denatured.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 SOUTH DEARBORN STREET, CHICAGO

At the Syracuse convention it was announced that the Thirtieth Annual Convention of the American Foundrymen's Association and the Second International Foundry Congress would be held in Detroit the week of September 27, 1926.

This will be the greatest event in the history of the foundry industry. A comprehensive program has already been outlined and a number of allied organizations in this country will be invited to meet in convention. Formal invitations are being mailed to twenty-seven European foundry, organizations and a good attendance from overseas is certain.

In conjunction with these conventions there will be held an International Exposition of Foundry and Machine Shop Equipment and Supplies. Actual exhibit dates have not been determined but a Saturday opening is being considered. Detroit is the leading foundry city of the world. It is said to be the biggest machine tool buying center in the country. The American Foundrymen's Association has not held a convention there since 1910, as they have been waiting for them to build hotels to accommodate such an attendance as would be attracted to Detroit. They now have them and have listed over 14,000 hotel rooms. The Convention Bureau has agreed not to schedule other prominent conventions during that week.

AMERICAN ELECTRO-PLATERS' SOCIETY

PHILADELPHIA BRANCH

HEADQUARTERS, CARE OF PHILIP UHL, 2432 N. 29th STREET

At the banquet of the Philadelphia Branch, on November 21, 1925, held at Mosebach's Hall, the program of the Educational Session, which began at 3 P. M., was as follows:

WILLARD M. SCOTT, Chairman

"Address of Welcome"

By Geo. Gehling

First Vice-President of the Supreme Society, and President of the Philadelphia Branch of the American Electro-Platers Society.

"Hydrogen Pitting of Nickel Plated Deposits, Its Cause and Cure"

By Charles H. Proctor

Founder of the American Electro-Platers Society; Consulting Electro-Plating Engineer of the Roessler & Hasslacher Company; Plating Chemical Editor of THE METAL INDUSTRY

"What Becomes of the Volts In a Plating Tank"

By Dr. W. Blum

Chief of Electro-Plating Division, Bureau of Standards, Washington, D. C.

"The Ammeter"

By A. P. Munning, 2nd

A. P. Munning Company, Matawan, N. J.

"Electrodeposition Pertaining to the Electrotype Industry"

By H. M. Blaetz

Superintendent of the Royal Electrotype Company, Philadelphia.

"Sulphur as an Oxidizing Agent"

By Wilfred S. McKeon

President of the Sulphur Products Company, Greensburg, Pa.

"The Preparation of Surfaces to be Electro-plated"

By George B. Hogaboom

Co-Author of "Electro-plating," by Blum and Hogaboom; Electroplating Engineer of the Hanson Van Winkle Company, Newark, N. J.

NEW YORK BRANCH

HEADQUARTERS, CARE OF JOHN E. STERLING, 468 GRAND AVE., LONG ISLAND CITY, N. Y.

The November meetings of the New York Branch, American Electro-Platers' Society, were well attended, the first of these being an open meeting, featuring Dr. Skowronski of the Raritan Copper Refining Company. He demonstrated by use of film lamp and lectured on copper refining. Other able speakers also addressed the meeting. These gentlemen answered all questions most readily and were well received. Among the speakers were: George Hogaboom, Newark, N. J.; F. J. Liscomb, Chicago, Ill.; Wm. Schneider, New York; Franklyn McStocker, New York; William Voss, New York.

The banquet committee of the New York Branch is now as follows:

Mr. F. D. McStocker, chairman, Mr. Minger, Mr. Sterling, Mr. Miller, Mr. Haushalter, Mr. Morningstar, Mr. Shorr, Mr. Schubert, Mr. Downs, Mr. Grimham, Mr. Tannert, Mr. Stremel.

The banquet will be held on Saturday, February 20, 1925.

CHICAGO BRANCH

HEADQUARTERS, CARE OF R. MEYERS, 2210 WILSON AVENUE

The fourteenth Annual Banquet of the Chicago Branch, American Electro-Platers' Society will be held in the Cameo Room of the Morrison Hotel, Clark and Madison streets, Chicago, Ill., on Saturday, January 23, 1926. Tickets, $3.50 per person. An interesting educational session will be held at 3 p. m. which will be followed at 7 p. m. by a splendid dinner and entertainment. Dancing will conclude the evening.

AMERICAN ZINC INSTITUTE

HEADQUARTERS, 27 CEDAR STREET, NEW YORK

Directors of the American Zinc Institute held a meeting at the Hotel Statler, St. Louis, Friday, November 6, 1925. After reports by the president and the chairman of the committees, it was decided that the slab zinc statistics should be released by night letter on the ninth day of each month and that the usual summary should be mailed at the same time to all names on the statistical mailing list.

Secretary Stephen S. Tuthill, 27 Cedar street, New York, was appointed secretary of the sectional committee on zinc coating of iron and steel under the American Engineering Standardization Committee and the American Society for Testing Materials, to undertake the national standardization of all zinc-coated material.

The board referred to the executive committee the matter of the proposed exhibit of the Institute of the products of the zinc industry at the Sesqui-centennial Exposition in Philadelphia, June to December, 1926.

The membership of the Institute is 210, of which 148 are active, 46 associate and 16 honorary. The 1926 annual meeting was set for St. Louis on April 19 and 20, 1926.

BRITISH ELECTRO-DEPOSITION SOCIETY

Previously, a few papers on electro-deposition have been read before the Faraday Society in London, England, but the need of an organization in which the subject could be discussed more from the practical viewpoint, and among those who are actually engaged in the work whether on commercial or research sides, has long been felt. To meet this need the Faraday Society has appointed a Provisional Committee to investigate the possibilities, and, as a result, a meeting inaugurating the new society was held. and arrangements are now progressing for holding a series of meetings during the present session.—A. C. B.

Personals

H. W. GILLETT

H. W. Gillett, the new chief of the Division of Metallurgy, Bureau of Standards, Washington, D. C., was appointed to that position to replace Dr. G. K. Burgess, who was made Director of the Bureau when Dr. Stratton resigned to assume the presidency of the Massachusetts Institute of Technology in Boston, Mass.

H. W. GILLETT

Dr. Gillett was born in 1883 and received his degree from Cornell University. He was employed as a chemist for a short period in the laboratories of Thomas A. Edison, and later in those of A. D. Little, Inc., of Boston. He returned to Cornell for graduate work and joined the instructing staff. He followed this step by going with the Aluminum Castings Company and installing their first laboratories. In 1912, Dr. Gillett joined the United States Bureau of Mines, being stationed at the Ithaca, N. Y., field office. His chief work for the Bureau there was studying brass melting practice, the electric smelting of ores and the preparation and study of special alloy steels. He did the initial development work on the rocking electric brass furnace which has since been so highly developed and has assumed a place of great importance in the brass melting industry. The leading furnace of this type is the Detroit rocking electric furnace made by the Detroit Electric Furnace Company, of Detroit, Mich. His studies on this type of furnace have been published in numerous bulletins of the Bureau of Mines and reprinted in THE METAL INDUSTRY, and other technical journals.

Dr. Gillett was recently transferred to the Bureau of Standards as chief of the Division of Metallurgy, and holds this position at the present time.

P. J. Riccobene has joined the home office sales organization of the Uehling Instrument Company, 473 Getty avenue, Paterson, N. J.

George N. Jeppson, works manager of the Norton Company, Worcester, Mass., has returned from abroad after visiting the company's plants in France and Germany.

Otto Halmbacher, for the past twenty-three years foreman of polishing and plating departments of the H. Mueller Manufacturing Company at Decatur, Ill., has resigned.

Ray A. Sossong, manager of gas plants, Air Reduction Sales Company, New York, was elected president of the International Acetylene Association, at the recent annual convention in Chicago.

K. D. McKoll of Forest, Ontario, Canada, will represent The United States Electrical Tool Company as its Canadian District manager, with offices in the city of Toronto, Ontario, Canada.

J. M. Price, formerly vice-president of the Electro Metallurgical Sales Corporation, 30 East 42nd street, New York, has recently been elected president of this company. **W. J. Priestley** has been elected vice-president to succeed Mr. Price.

Walter J. Kenney is now foundry superintendent at the New Britain, Conn., plant of the North & Judd Manufacturing Company, succeeding his father, the late Martin H. Kenney. Mr. Kenney is a graduate of the Rensselaer Polytechnic Institute. **Elmore E. Morse** has been appointed assistant superintendent to succeed Mr. Kenney.

H. A. Watkins has recently been appointed Metropolitan District sales manager for the Bridgeport Brass Company, with offices in the Pershing Square Building, New York City. Mr. Watkins comes to this appointment with a wide experience in general industrial and utility development work. He is better known, perhaps for his work as Superintendent of Docks under the Mitchell Administration and as a Major of Engineers during the late war.

G. R. Swany was promoted to the superintendency of the Alcoa plant of the Aluminum Company of America, succeeding B. L. Glasscock, resigned. Mr. Swany has been assistant superintendent of the plant since 1920. The Alcoa plant is located in Maryville, Tenn. **B. L. Glasscock,** who is leaving the superintendency of the plant, has served in the capacity since 1914. Mr. Glasscock will remain in Maryville, where he will enter the insurance and investment business.

Albert P. Slater has been appointed general superintendent of the aluminum and brass foundries of the Detroit Aluminum & Brass Corporation, Detroit, Mich. Mr. Slater is an expert foundryman, well known to the trade as a pioneer in production of aluminum, having been in the early days of the industry with the Aluminum Castings Company, later having charge of the Willys-Overland foundry, Toledo, then in charge of production with McAdamite Aluminum Company and General Aluminum & Brass Manufacturing Company, Detroit, and having been intimately connected with the production and development of large and intricate castings.

According to press reports, **A. W. Gray,** works manager of the Bristol Brass Company, Bristol, Conn., has terminated his connection with that plant recently. Mr. Gray came to Bristol as manager of the Bristol Brass plant about two years ago, shortly before the stockholders' differences over the presidency of the concern, in which **Mr. Harper** was elected over the late Albert F. Rockwell. It is understood that Mr. Gray is soon to accept a responsible place with a large Hartford concern. The place made vacant by the resignation of Mr. Gray will not be filled. **John Vickers,** superintendent of the plant, is likely to assume some of the duties formerly cared for by Mr. Gray.

Ernest W. Duston, formerly chief engineer of the Blake & Johnson Company, Waterbury, Conn., for ten years (1910-1920) was again appointed chief engineer of this company on November 2nd, succeeding F. J. Kane, resigned. Mr. Duston for the past six years has been chief engineer of The American Bolt Corporation, with headquarters at Bayonne, N. J. His prior connections were with Waterbury Farrel Foundry & Machine Company, Waterbury, Conn.; the Lake Erie Bolt & Nut Company, Cleveland, Ohio; Russell Burdsall & Ward Bolt & Nut Company, Port Chester, N. Y., and Morgan Construction Company, Worcester, Mass. Mr. Duston is the originator of various patents in cold strip and flat wire machinery and is widely known in that field.

Obituaries

DWIGHT L. SOMERS

At a meeting of the board of directors of the American Brass Company, held October 22, 1925, at the office of the Anaconda Copper Mining Company, in New York City, a vote was passed: That the members of the board had learned with sincere regret of the death of Dwight L. Somers, an old and highly respected employee of this company, which occurred at his home in Waterbury, Connecticut, on the 20th instant, in his ninety-third year.

Born in Waterbury in 1832, he entered the employ of the Benedict & Burnham Manufacturing Company, of Waterbury (which corporation later became a constitutent part of the American Brass Company), at the age of sixteen and continued in its service, occupying positions of responsibility in the rolling mill department, until his seventieth year. His service record was unbroken with the exception of a period during 1862 and 1863 when he served with the Connecticut troops in the Civil War. During that time he fought in several battles, including Antietam, Maryland, Fredericksburg and Chancellorsville, Virginia, Gettysburg, Pennsylvania and other important engagements.

At the age of seventy, he relinquished his position and was placed on the retired list of the company. His connection with the company, except for the interval above noted, covered a period of seventy-seven years and constituted a connecting link with the earliest days of the brass industry in this country, in the development and growth of which he participated for many years and in which he continued to be interested throughout his life.

The members of the board expressed their appreciation of his high character and many sterling qualities, of his fidelity in the company's service, and of the record of a long and useful life which exemplified the best ideals of citizenship.

WILLIAM W. CARROLL

William W. Carroll, with the American Brass Company in Waterbury, Conn., was killed on October 16, 1925, by a stake falling on him from an overhead crane. He was born in County Tipperary, Ireland, April 23, 1861, came to America at twenty-eight years of age and settled in Torrington, Conn. Two years later he entered the employ of the Coe Brass branch of the American Brass Company (now controlled by the Anaconda Copper Company) and engaged in drawing and finishing brass wire. After a number of years he became foreman of the shaped wire drawing department and acted in that capacity until his death.

Mr. Carroll was an authority on shaped wire and it was often remarked that he could make anything out of brass. His wire blocks also drew silver, nickel silver and Coe bronze. He was capable and steady, having been employed at this line of work for thirty-four years. He is survived by a wife and two children.

WALTER H. PERKINS

Walter H. Perkins, formerly vice-president of the J. B. Wise Company, Watertown, N. Y., died at his home in that city October 18, 1925, following a five years' illness. He was born in Columbia, Conn., in 1870, and was at one time superintendent of the Waterbury Manufacturing Company, Waterbury, Conn. Mr. Perkins accepted a position as superintendent of the Wise company in 1911, later becoming vice-president. In 1920 he resigned this position and was made president of the New Jersey Tube Company, Newark, N. J., but was forced to resign a year later on account of ill health.

MARTIN H. KENNEY

Martin H. Kenny died at the New Britain General Hospital, October 12, 1925, following a short illness. Mr. Kenney was foundry superintendent of the North and Judd Manufacturing Company of New Britain, Conn. He was a native of Sharon, Conn. Mr. Kenney had been associated with the above company about 35 years and was one of the best known foundrymen in Connecticut.

WILLIAM G. HOLLAND

William G. Holland, 61 years old, a lifelong resident of Indianapolis and for the last twenty-five years connected with the Langsenkamp-Wheeler Brass Works, died recently. Mr. Holland for many years was secretary of the Indianapolis Excelsior Machine Company, makers of special machinery.—E. B.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

DECEMBER 1, 1925

The **Connecticut Brass & Manufacturing Company** of Watertown avenue, this city, closed its doors last month and laid off its 200 employes. The concern has been under a receivership ever since reverses suffered following the war and it is understood that the plant will soon be sold in order to wind up its affairs.

Maurice E. Mayo, receivers' agent and plant manager, denied that the factory closed because it is operating at a loss. On the contrary, he claimed, it has been operating very successfully. The receivership does not owe a nickel and is even with the world, he said, adding that the closing was a natural step to terminate the unusually long drawn out receivership. He would not say whether or not the plant would be sold but said he expected it would reopen soon under new management. A plan for reorganization will be submitted to the stockholders, he said.

The concern was organized during the war and in addition to its plant on Watertown avenue, purchased a brass plant in Cheshire. It had Government contracts and was sued for $50,000 on the charge of violating one of them, it being charged that copper supplied it by the Government, it had diverted to use in manufacturing private orders. Many other claims of creditors were pressed by local attorneys who sought to have the firm adjudicated a bankrupt, but it was allowed to continue business under a receivership and is understood to have paid most outstanding claims. It is capitalized at $3,000,000. The Equitable Trust Company of New York is said to be a heavy creditor.

The **National Company's** plant, formerly manufacturing brass wire and small tubes, has been sold to the **Chemical Treatment Company**, a newly organized firm of New York interests, for a price in the neighborhood of $100,000. It was formerly owned chiefly by **Judge M. J. Byrne**, recently deceased, and the sale was to allow the settlement of his estate. The shop had not been operated for some time.

Fred W. Olmstead, W. A. Tyrrell and **L. C. Owens**, representing the new owners, are in the city arranging for starting up the plant again. It will be used for the manufacture of

"Crodon," a chromium electro-plate patented by the company.

F. S. Chase, president and treasurer of the **Chase Companies,** as chairman of the special committee of the Connecticut Manufacturers' Association, has framed and transmitted to President Coolidge, a resolution deprecating the temporary debt arrangement made with France as tending to weaken French prestige and credit and hinder a rehabilitation of normal business conditions throughout the world. The resolution commends the terms of the settlement with Italy and urges that the government again take up with France the question of settlement and offer her more favorable terms.

James B. Walker, city plumbing inspector, attended the annual meeting of the American Society of Sanitary Engineers in New York, last month, and there read a paper on the advantages of brass pipe over all other kinds and urging that it be installed wherever possible. It lasts indefinitely, does not fill up with rust deposits, insures freedom from leaks and delivers a full flow of clean water, he said. He traced the history of brass pipe making and described its manufacture in Waterbury.

John H. Goss, vice-president and general superintendent of the **Scovill Manufacturing Company,** was re-elected vice-president of the Connecticut Manufacturers' Association at its annual meeting at New Haven, last month. He presided at the afternoon meeting and gave a report on the activities of the research committee. F. S. Chase, of the Chase Companies, gave a report on the work of the power and waterways committee.

F. S. Chase, at the hearing before the Public Utilities Commission in Hartford, last month, made a long plea in favor of the coordinated rail and bus program of the New Haven road as opposed to operation of bus service by private concerns in competition with the New Haven road. If the New Haven is not allowed this, the freight rates will have to be increased to offset passenger receipt losses, he said, and this would be a blow to state manufacturing interests.

The board of directors of the **American Brass Company** passed a resolution on the death of **Dwight L. Somers** which occurred last month. Mr. Somers, 93 years of age, had been on the payroll of the company 77 years, although he has not worked for the last 23 years, but has been kept on the pension list. He entered the employ of the **Benedict & Burnham Manufacturing Company,** later a part of the American Brass, in 1848, at the age of 16. He left the company's employ to serve in the Civil War during 1862 and 1863 but was still kept on the payroll. He fought at Antietam, Fredericksburg, Chancellorsville and Gettysburg. In 1902, at the age of 70, he relinquished his position with the firm, having worked for it continuously for 54 years, or ever since he was 16 years old. He was then placed on the pension list where he has been ever since. The resolution adopted recited these facts, stating his service constituted a connecting link between the earliest days of the brass industry. His fidelity and sterling character were highly praised.

E. O. Goss, president and general manager of the **Scovill Manufacturing Company,** was elected a director of the National Association of Manufacturers at the annual convention of the organization held in St. Louis, last month, although he, himself, was not present at the convention.

Frank P. Noera, formerly president and general manager of the **Noera Manufacturing Company,** now owned by the **Chase Companies,** crushed his foot in an elevator accident at the Hotel Elton, several months ago. He has now brought suit against the hotel for $25,000 damages, alleging that the accident was due to the fault of the elevator operator. He is expected to be lame for life as the result of the accident and has spent large sums for operations and hospital care, he states.

The **International Silver Company,** with plants here and in Meriden and other cities, has decided to issue 51,445 shares of treasury stock to its stockholders at $75 a share at the rate of five and one-half shares for each share now held and with the proceeds will pay the accumulated dividends of 7 per cent on the preferred stock and the outstanding preferred dividend scrip. The stockholders protective committee has agreed to this and to the purchase of the **Colt Patent Firearms** plant at Meriden for 2,500 shares of the common stock. It states that the company will commence payment of dividends on common stock at the rate of 6 per cent on April next.—W. R. B.

BRIDGEPORT, CONN.

December 1, 1925

C. F. Dietz, president of the **Bridgeport Brass Company,** spoke on the anthracite strike at the annual meeting of the Connecticut Manufacturers' Association in New Haven, last month. He told of the issues involved on the side of both the miners and operators, pointing out that such continued strikes in this industry is driving householders to a greater and greater extent to the use of substitutes for anthracite. **Joseph A. Horne,** vice-president of the **Yale & Towne Manufacturing Company** of Stamford, was elected director of the association for this county.

The **Remington Arms** has won its point in a protest filed with the United States patent office against the proposed trade mark of the **Utica Knife & Razor Company** of Utica. The latter's application sought to register the words, "Red Point" in connection with a red disk on its razors, shears and hair clippers. This was protested by Remington because it uses a red disk as a trade mark on similar articles. On this ground the Utica firm's application was refused by the patent office, but the case was reopened when that concern filed affidavits showing that it had discontinued the use of a red disk and only used the words, "Red Point." In consequence of this, it then obtained registration for these words as its trade mark without the use of the red disk, which was not protested by Remington.

R. I. Neithercut, of the **Bridgeport Brass Company,** was a member of the special committee of the Connecticut Manufacturers' Association which appeared before the Interstate Commerce Commission in Washington, last month, to urge the establishment of through all rail rates on prepared sizes of semi-bituminous coal from West Virginia fields to Connecticut points to meet the present emergency caused by the anthracite strike. The committee of which he is a member was instrumental a few weeks before that in securing the establishment of the first through rail rates on domestic sizes from these fields and has appeared before the commission at other times during the past year.

The **Yale & Towne Manufacturing Company,** of Stamford, has purchased the **Miller Lock Company,** of Philadelphia, and the latter plant will hereafter be known as the **Miller Lock Works,** of the Yale & Towne Company. **E. C. Waldvogel,** vice-president of Yale & Towne Company, has gone to Philadelphia as director of the sales policy of the Miller works. This is the third lock company the Yale & Towne concern has acquired within the last few months, the others being the **Sager Lock Company,** of Chicago, and the **Barrows Lock Company,** of Lockport, Ill. With its plant in St. Catherine, Canada, and a plant in Germany, it is now said to be the largest manufacturer of locks and builders' hardware in the world.

The **General Electric Company,** last month, announced the inauguration of a group insurance program for the benefit of its employes in this and other cities. It will constitute the largest life insurance policy ever underwritten, it is said, the total insurance for the 70,000 employes in all its plants everywhere, amounting to $170,000,000. The insurance has been apportioned between the Metropolitan and the Travelers. It becomes effective as soon as 75 per cent of the eligible employes apply for it. Officials at the local plant are working on it now. It is offered to male employes under 70 years and female employes under 60 years without medical examination. Those who have served the company one year or more will receive $500 insurance if their wages or salaries are $1,200 or less, at a monthly cost of 30 cents; $1,000 if their pay is between $1,200 and $1,800 at a monthly cost of 75 cents, and $2,000 if their pay is between $1,800 and $4,000 at a monthly cost of $1.70.

Reports that the **Colonial Air Transport,** of Naugatuck, which has secured the government air mail contract for the Boston-New York route would establish an airport here were dispelled by a statement here, last month, by **Major Talbot Freeman,** a director of the lines. If the city wants an airport it must be built by the city itself on its own initiative, he said. Possibly if such a port were built the Colonial lines would run a plane direct from its main line to Bridgeport if there were enough mail to warrant it.

The entire plant of the **Heppenstal Foundry** closed down for the day, at the funeral, November 23, of one of its oldest employes, **John Callahan,** killed in an automobile accident.

During the recent city political campaign, vigorous attacks were launched against the **Automatic Machine Company** for its non-payment of taxes by the Republican candidate for Mayor, the present incumbent. Its president, **W. E. Burnham,** is president of the taxation board, appointed by the state rather than the city under the terms of the so-called "Ripper" bill which taxes power of taxation out of the city's control and lodges it with the state. Mr. Burnham supported this bill and also supported the Democratic candidate for Mayor. Last week, the tax collector announced that the company had paid $1,000 as part payment of its back taxes and had arranged to make regular semi-monthly payments until all is paid.

The linking up of Bridgeport, Westport, Shelton and Stratford into one great waterworks system will be completed by Christmas according to **President Samuel P. Senior,** of the **Bridgeport Hydraulic Company.**

Joel T. Daves, chief of the lecturing staff of the Business Training Corporation of New York, will give a series of lectures on indusry to the foreman in the manufacturing plants of the city during the winter. They will be given at the Y. M. C. A.—W. R. B.

TORRINGTON, CONN.

DECEMBER 1, 1925

Business conditions in Torrington, especially so far as the metal plants are concerned, are excellent and the prospects are exceedingly bright for an unusually good winter. Over 200 more workers are employed in the shops here than were employed two months ago, the tonnage of shipments is 8 per cent higher than at the corresponding time last year, and several of the shops are working overtime in the effort to keep up with the orders.

Although there are more workers in town and building operations have not been excessive, there are more rents available in Torrington today than there were six months ago. The reason for this is not known as yet.

Charles E. Morehouse, one of the original incorporators of the **J. H. Graham Manufacturing Company,** has severed his connections with that firm.—J. H. T.

PROVIDENCE, R. I.

DECEMBER 1, 1925

The past month has witnessed a slight improvement in all branches of the metal trades, especially those connected with the manufacturing jewelry and building lines. It is a long time since so many employes have been enrolled in the jewelry factories and so few unemployed, as at present. While much of this is due to the seasonal demands because of the holidays, still the demand for staple goods indicates an activity that is expected will be more lasting than a few weeks, and to make the beginning of a continued period of good business.

The various lines in the building trades, which have been fairly active all the fall, has improved to such an extent as to maintain a situation that keeps the number of unemployed at a low minimum. The unusually large number of extensive building operations now in process or in contemplation, promise a period of steady work that will be halted only by adverse weather conditions.

On the eve of the taking of the biennial industrial census by the United States Department of Commerce, it is interesting to review the figures that have just been made available by W. M. Stewart, director of the United States Census Bureau. The statistics just compiled of the 890 manufacturing establishments of all kinds in Providence, having an annual production of $5,000 or more, show an increase of $45,537,625 in the value of products manufactured in this city during 1923 as compared with the total value of 1921. The total value of manufactured goods produced in Providence in 1923 was $215,654,286 compared with $170,116,661 in 1921.

The Providence industries employed 45,495 persons in 1923 in all the lines reporting, as against 38,568 in 1921. The wages paid in the two corresponding year were $52,969,512 and $40,809,520 respectively. Jewelry stands second in the list of value of manufactures, the value of the products of this industry in 1923 being $34,494,740 as against $26,502,481 in 1921.

Although two years old, these statistics which are the latest available being the last official tabulation that has been made, they show the very material improvement in conditions that has been made when compared with the statistics for 1921.

A summary of statistics of the various metal industries follows: Brass, bronze and other non-ferrous alloys and manufactures of these alloys and of copper; 1923—From seven establishments, with average number of 129 wage earners, receiving $113,115 in wages and producing goods to the value of $537,931. 1921—From five concerns, the average number employed was 70, with wages totaling $74,156 and producing $419,172.

Copper, tin and sheet-metal work: 1923—21 firms, employing 166, wages amounting to $262,252 and producing total value of $1,063,581. 1921—13 firms, 160 employes; $193,052 wages; $705,602 production.

Electro-plating: 1923—From 12 firms, employing 108; wages $100,524; producng $303,109. 1921—Not classified.

Enameling and japanning: 1923—From 5 firms, employing 52; wages $47,314; producing value of $92,123. 1923—No classification.

Gold, silver and platinum reducing and refining (not from the ore): 1923—From 17 firms, employing 56; wages of $86,-281; value of production, $2,292,068. 1921—From 19 firms, employing 66; wages of $87,731; value of production, $4,640,547.

Jewelry: 1923—From 219 concerns, employing 7,254; wages of $7,744,523; value of production, $34,494,740. 1921—From 259 firms, employing 6,552; wages of $6,378,279; producing $26,502,481.

Silversmithing and silverware: 1923—From 6 concerns, employing 1,152; wages of $1,744,694; value of production $5,537,-130. 1921—From 10 concerns, employing 1,247; wages $1,784,-468; value of production $4,289,214.

Wirework (not elsewhere classified): 1923—From 6 firms, employing 98; wages of $87,387; value of production, $357,992. 1921—From 3 firms, employing 49; wages of $56,404; value of production, $188,253.

George F. Staples, assistant secretary of the American Screw Company, died November 26, at his home, 18 Second street, North Providence, from a combination of heart trouble and Bright's disease, in his 61st year. He had been confined to his home less than three weeks. He was born in Providence, January 10, 1865, and received his education in the public schools. At the age of 16 years he entered the employ of the American Screw Company and worked his way up through the various grades to the position he held at the time of his death. His wife died last March.

The **Beverly Electro-Plating Company,** which has been located at 74 Clifford street for a number of years, has recently removed its office and plant to new and larger quarters at 140 Chestnut street.

A. Shehan & Company is the name of a new firm that has recently started in the manufacture of jewelers' findings and metal novelties at 9 Calender street. The members of the concern are Christopher L. Migliaccio and Fritz R. Johnson, of the Hingeco Manufacturing Company, and Ara Shehan, formerly of the De Luxe Art Metal Corporation.

A permit has been granted the **Pearl Chemical Products Company** for the erection of a new chemical plant on Chapman street, at "Manucentre," for the manufacture of its line of pyroxolyn lacquers, lacquer enamels, bronzing solutions and other chemical specialties. The proposed building will be of brick, concrete and steel mill construction throughout, one story high and 50 by 53 feet. It will be erected on a tract of land 80 by 160 feet which will allow ample space for any extension that may be necessary.

Fauste A. Muscente has recently started in the manufacturing of a general line of white metal novelties at 294 Chestnut street under the firm name of the F. A. M. Company, occupying quarters formerly used by the Walter A. Hunold Company. Mr. Huscente was formerly connected with V. E. Black Company for about ten years.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

DECEMBER 1, 1925

A feeling of genuine optimism prevails in all manufacturing circles in Rochester. Increasing activities are noted in the leading plants employing metals exclusively, and a much larger percentage of labor is now employed in the city.

Particularly is this true in such plants as the **General Railway Signal Company** in Lincoln Park, which is now operating at full speed owing to an accumulation of large railway equipment orders and with others in prospect. In the manufacture of these signal devices much copper, brass, nickel and tin-plate is required.

In addition to the **Eastman** kodak plant and the **Bausch & Lomb** optical works, both of which are operating at higher levels than earlier in the fall, increased activity is noted in the several brass foundries and perforating plants about town. The **Van Bergh Silver Plate** works is reported to have increased its output about 20 per cent since October 1st.

Building operations continue on a very heavy scale in Rochester, which contributes to the steadiness in the market for copper and brass sheets and brass rods, as well as for tin and zinc.

Herbert W. Bramley, president of the **Rochester Chamber of Commerce**, states that reports from prominent metal-using manufacturers about the city were of a highly encouraging nature, and he predicted a period of a greatly increased activity and prosperity in 1926. Mr. Bramley said that there were no unusual developments in the way of new industries of late, but that the Chamber felt certain that the city's expansion industrially would be more marked during the winter months. —G. B. E.

TRENTON, N. J.

DECEMBER 1, 1925

The metal industry plants of Trenton report a wonderful increase in business during the past month and all are now operating to capacity. Every department of the big plant of the **Jordan L. Mott Company** is rushed with orders and the concern has made a great showing under the receivership of Charles H. Baker and Robert K. Bowman, who have been in charge for some time. For a time the different departments were not operating to capacity, but all the employes are now working fifty-four hours a week. The **John A. Roebling's Sons Company, Skillman Hardware Manufacturing Company, Jonathan Bartley Crucible Company, Trenton Brass and Machine Company, Trenton Emblem Company,** and **Billingham Brass and Machine Company** are also busy.

The capital stock of the **Ingersoll-Rand Company,** Phillipsburg, N. J., has been increased from 300,000 shares of common stock, each with a par value of $100, to 1,500,000 shares without par value, according to a certificate filed in the office of the secretary of state. The issuance of 50,000 shares of preferred stock, par value $100 each, also is provided. The certificate discloses that 240,563 shares of the common stock are now outstanding. Each of these will be exchanged for four shares of the new common stock.

The following concerns were chartered here during the month: **New Jersey Safety Razor Blade Manufacturing Company,** Irvington, manufacture safety razors; $75,000 capital; **Rankin-Kennedy Foundry Inc.,** Newark, foundry business, $125,000 capital; **Vis Chemical Manufacturing Company,** Bloomfield, manufacture chemicals, $125,000 capital; **August Dunn and Company, Hoboken,** operate a foundry, $20,000 capital; **Kleen-Heat Passaic Company,** Passaic, heating devices, $10,000 capital; **Duralad Chemical Corporation,** Newark, manufacture chemicals, $20,000 capital; **Universal Chemical Products Corporation,** Jersey City, manufacture chemicals, $50,000 capital; **Seaboard Electric Manufacturing Company, Inc.,** Jersey City, manufacture electrical appliances, 500 shares no par; **Butler Fountain Pen Company,** Butler, manufacture fountain pens, $50,000 capital; **Royal Electric Company,** Jersey City, electrical supplies, $125,000 capital; **H. and D. Radio Company,** Summit, N. J., radio supplies, $100,000 capital; **Eisner Plumbing Supply Company,** Newark, plumbing supplies, $100,000 capital; **Lyric Corporation,** Newark, radio supplies, $100,000 capital.—C.A.L.

PITTSBURGH, PA.

DECEMBER 1, 1925

A score of large industries have plants in New Brighton, Pa., which is a small town with a population of about 10,500, situated 28 miles northwest of Pittsburgh, on the east bank of the Beaver River. Among the largest industries there are the **Standard Sanitary Manufacturing Company, American Vitrified Products Company, Riedel & Sons Manufacturing Company,** brass and bronze foundries; the **Strayer Coin Bag Company, Pittsburgh Rust Proof Company, Standard Specialty & Tube Company.**

The **Standard Sanitary Seamless Tube Company,** with offices in Pittsburgh, according to reports, is planning a large addition to its plant at Economy, Pa. Along with the addition, a machine shop is to be constructed, it is said.

Activity in the electrical industry is reported form all sections of the state. Orders placed for motors, control equipment and general supplies have been enormous in the past week. Demand for electric furnace equipment is also good. Good business has been transacted in wire and cable, reflecting confidence on the part of buyers in the copper situation. —H. W. R.

MIDDLE WESTERN STATES

CLEVELAND, OHIO

DECEMBER 1, 1925

Coming of cold weather has found no decrease in metal trades' activities. Cleveland is industrially stable, a condition which observers believe will continue, after the period of depression in some lines of industry, including the metal trades, which prevailed throughout the spring and summer months.

The **Ohio Brass Company** last week announced an extra dividend of $1 a share. Demand for Ohio Brass shares was quickened in the Cleveland market by this announcement and were firm at 80. This company has been a most liberal dividend payer, having paid $15 regular and $11.50 extra in cash and 200 per cent in stock between July 15, 1922, and July 15, 1925. Since the stock distribution in July the company has declared $1 regular and $1 extra, indicating, it is believed, the company's intention of paying $5 a year on the increased capital.

S. W. Stanyon, Ohio Brass Company, Mansfield, last week spoke before the Central Ohio Manufacturers' Association meeting in Hotel Harding, Marion, Ohio. Members heard reports from the committee on iron and steel rates and engaged in a discussion of the freight rates on petroleum in Ohio.

The **Aluminum Castings Company,** Cleveland, has subleased a tract 97 by 240 at 6115 Carnegie avenue, Cleveland, to the Carnegie Company, who will erect a three-story building for the Carnegie Body & Auto Top Company on the site. The ground was leased in 1913 by the aluminum firm, the deed being signed by Secretary of the Treasury Andrew Mellon.

Incorporation papers were recently taken out by the **Edwin Poulton Foundry Company,** Columbus. The firm is incorporated for $30,000. Incorpoartors are: Edwin, Mary Jane, Edward H. and Alfred S. Poulton and Harry A. Warner.

The **Hohman Plating Company, Dayton,** recently moved into its new brick building at 815 East Fifth street. Output of the plant has been greatly increased by the move. William Hohman is manager.—S. D. I.

INDIANAPOLIS, IND.

December 1, 1925

The **Hammond Plating Works** at Hammond, Ind., has opened a branch office and plant at 411 West Walnut street, Crown Point, Ind.

Tentative arrangements have been made to move the factory of the **Indianapolis Plating Company** from its present location at 635 Kentuky avenue to a new and modern building at 425 West Vermont street, Indianapolis. A building permit has been granted for the erection of a new structure at a cost of $15,000. New factory equipment will be purchased amounting approximately $30,000.

The **Bronze Piston Ring Company** of Indianapolis, makers of piston rings, has filed a certificate of preliminary dissolution.

Fire recently in one of the storage rooms of the **Commercial Solvents Corporation** at Terre Haute, Ind., caused considerable loss. Just a few days prior a fire caused by a bursting tank caused damage to stock and building estimated at $30,000. Two explosions of chemical tanks rocked that entire part of the city, leading citizens to believe an earthquake had occurred.

Part of the production of the **American Closet Valve Company** of Indianapolis has moved to a new building on the company's site. The move was made because of increased production. The company was formed primarily for the purpose of manufacturing plumbers' specialties, but at present this branch of production is being superseded by porcelain enameling, this branch of the business having grown rapidly.

Negotiations are under way, it is announced by **Isaac Marks,** secretary of the newly incorporated **Midwest Engine Industrial Company** of Indianapolis, to have one of two or three eastern foundries moved to Indianapolis to occupy the large foundry of the Midwest Engine Company plant, recently acquired by the new corporation at a receiver's sale. The foundry is one of the best equipped and largest in the country, Mr. Marks said. In the organization of the Midwest Engine Industrial Company, with a capital stock of $100,000, Samuel Falender was elected president; A. M. Kahn, vice-president; Mr. Marks, secretary; Joseph Cohen, treasurer, and Louis J. Borinstein, assistant treasurer.—E. B.

DETROIT, MICH.

December 1, 1925

Roger F. Hill of Detroit has been awarded a contract for a factory addition to be erected for the **Long Manufacturing Company** at Detroit.

The name of the **Peter Markey Corporation** at Detroit has been changed to the **General Aluminum & Brass Company,** it is announced.

Albert P. Slater has been appointed general superintendent of the foundries of the **Detroit Aluminum & Brass Corporation.** Mr. Slater is an expert foundryman and a pioneer in the production of aluminum, having been in the early days of the industry with the **Aluminum Castings Company,** later having charge of the **Willys-Overland** foundry at Toledo, then in charge of production with the **McAdamite Aluminum Company** and the **General Aluminum & Brass Manufacturing Company** at Detroit.

A new type of aluminum alloy casting for bearing caps, formerly used only in aviation engines, is now used by the **Cadillac Motor Car Company** on the three main bearing caps of its crank shaft. Former practice was to use an alloy of aluminum with copper, which had the required stiffness but needed to be reinforced with a steel plate. In the new practice a quality of aluminum known as "Y-metal," with a mixture of nickel, copper and magnesium, is cast in a steel die instead of in sand. Afterwards it is heat-treated. In this process the caps are cast much closer to size, are more uniform and require less finishing. Only within the last few years has the heat-treating of aluminum became a production method and it is not yet in general use, according to L. A. Danse, Cadillac metallurgist. "With the process used on our bearing caps it is possible to obtain a breaking strength up to 45,000 pounds per square inch," he says. "In the new Cadillac foundries the sand for casting is carefully analyzed. Five different kinds of sand are required for work in the aluminum, bronze, brass and iron foundries."

General business conditions are good in Detroit and especially so in the copper, brass, grey iron and aluminum fields. Practically every plant in the city and suburbs is engaged in production with plenty of orders ahead to keep everyone busy for a long time. Most of these concerns of course are producing automobile supplies and so long as the motor industry keeps at its present speed there will be no let up for concerns supplying its demands. Labor is ample and the year will go out as one of the best in the metal industry history. The new year has even brighter prospects than the one that is now drawing to a close.—F. J. H.

CHICAGO, ILL.

December 1, 1925

General conditions in the metal industries in Chicago and vicinity are unusually good. Most of the plants are running to capacity and others, overtime, in order to keep up with production demands. Radio supplies are showing a much larger demand. The present year will close with a record as one of the best in the history of the industry.

Of interest to all of the metal trade in this section are the reports of the Chicago Association of Commerce, recently published on the occasion of its twenty-first birthday, as they relate to the metal trade and the position it occupies in this territory.

Advertising Metal Display Company, 1001 Washington Boulevard, is a new corporation that has been capitalized for $25,000. They will manufacture and deal in display devices, novelties and specialties. The incorporators include: Walter L. Thompson, George R. Lund, John Jung. Correspondent, Edwin J. Raber, 160 North La Salle street.

The **National Cash Discount Corporation,** 209 South La Salle street, has been capitalized for $100,000. They will make, print and publish metal novelties, as well as deal in cash coupons and certificates redeemable in cash only. George C. Bunge, Paul S. Parsons and Calud D. Raber are the incorporators.

Wabash Valley Maytag Company, Lawrenceville, are a newly incorporated company with a capital stock of $6,000. They will conduct a general wholesale and retail business in washing machines and electric equipment. Incorporators: Morris L. Mann, Roy L. Hallbeck and James N. Walton. T. H. Marshall of Marshall is the attorney.

American Ideal Oil Burner Company, 1905, 11 South La Salle street, has been incorporated with a capital stock of $1,000. They will engage in the manufacture and sale of burning devices. The incorporators are J. E. Geisler, Leo B. Lowenthal. Raues and Lowenthal are the correspondents. Their address is 11 South La Salle street.

E. J. Ewert & Company, 177-79 North Franklin street, capitalized for $25,000, will carry on a general hardware business. Adolph H. Easter is the correspondent, while the incorporators include Edwin C. Ewert, Earl W. Ewert, Fred C. Ewert and E. W. Ewert.

The **Free Strom Company,** 12032 La Fayette avenue, has been capitalized for $20,000. They will manufacture and deal in heaters, stoves, furnaces, power plants, etc. The incorporators are Abel Levy, V. E. Crosell and Arthur Freestrom. Correspondent, Frisch & Frisch, 6 North Clark street, Suite 103.

The **Bee Mack Furnace Company,** 28th street, and 61st street, Cicero, are capitalized for $20,000. They will improve, invent and develop conveyor furnaces for ceramic products. A. C. Wild, Harry Leroy Jones are the incorporators.

Maywood Auto Body & Repair Company, 513 Railroad street, Maywood, has been capitalized for $10,000. They will repair and paint automobile bodies, tops and auto accessories. The incorporators are Francis H. Oehlert, Anna D. Boyle, George Oehlert and Ray Boyle. Correspondent, Guerine & Brust, Citizens State Bank, Melrose Park.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

NOVEMBER 17, 1925.

A useful paper on nickel silver was given before the Birmingham Local Section of the Institute of Metals on November 3 in a paper by Messrs. W. C. Gray and R. E. Ansell, entitled "Some Notes on the Properties of Nickel Silver." The authors described the progress made in the manufacture of the alloy and anticipated an extensive increase in its use as the result of the greatly improved qualities of the material from the engineering point of view. It was said that information was needed both by users and manufacturers especially with regard to annealing temperatures and examples were given of the disastrous effects of over annealing by users of the material. In one instance £400 worth of material had to be scrapped. Professor Turner said sulphur was always unsatisfactory, even with as low a proportion of sulphur as .04. Some speakers took exception to the statement that the higher the nickel the better the working of the material. The members agreed that the greatly improved quality of copper and other metals now available had reduced the danger of a failure and greatly assisted the manufacturer.

The electroplate trade is busier than for some time past and silversmiths are also very well engaged. The demand has been greatly assisted through the improved quality of nickel silver available and the most important works in Birmingham are busy beyond all previous experience and are enlarging their works. The Christmas trade includes a large proportion of table ware of a fancy description and improved buying is reported from Australia, New Zealand and South America. The usual autumn activity has appeared in the jewelry trade which is busier than for a long time past. The motor and cycle industries have in many cases increased their output by over 100 per cent since last autumn and this has brought a great stimulus to the business in cycle accessories, practically all the factories working overtime, while extensions have been necessary to cope with the extraordinary demand. Makers of magnetos and electric batteries are also very actively engaged.

In the copper trades some useful orders have been placed for copper tubes especially in the building of locomotives and special engines. Prices are very finely cut and although some of the materials used, especially zinc, are costing more money, no equivalent advance has taken place in prices. Foreign competition is not particularly troublesome and there is no difficulty in meeting it. The trade in brass and copper wire is dull with finely cut prices.

Great preparation is being made for the British Industries Fair which will very largely be devoted to the display of aluminum, brass, copper and similar products. The government has devoted £50,000 to the assisting of the Birmingham and London sections which has enabled lower charges to be made for space, and it is thought likely that instead of three halls to accommodate the exhibits a fourth hall may be required.

For general brass products the volume of demand has increased very much as compared with a year ago. Manufacturers who specialize in stamped goods began the year with heavy stocks which have been satisfactorily disposed of. The Dominions continue the best customers for domestic brass work and the demand for plumbing and decorative brass is quite up to the usual level. The branches devoted to shopfitting and the manufacture of specialties for bar and window fitment are well engaged. Large quantities of fittings for licensed houses in the Dominions are regularly supplied from Birmingham and this trade is rather busier than usual.—J. H.

Business Items—Verified

The **Arcade Smelting & Refining Company**, Springfield, Mass., metals, has been incorporated with capital of $100,000.

The **United States Electrical Tool Company** is arranging to travel its own salesmen in the Southern States, and has accordingly withdrawn its selling arrangements with the Backmeier Sales Corporation of Cincinnati, Ohio.

The **Empire Plating & Manufacturing Corporation,** 77 Madison avenue, Albany, N. Y., is planning to increase its facilities at a cost of $15,000. This firm operates the following departments: plating, japanning, polishing, lacquering.

A pot of chemicals, exploding in the plant of the **Oakland Plating Works**, 517 Eighteenth street, Oakland, Cal., started a fire which severely burned two men and caused damage estimated at $2,000. The plant was shut down only five days.

The **Anode Corporation of America** reports an increase in its November, 1925, sales of anodes over the November, 1924, sales of 160%. Additional equipment has been bought and is being installed to take care of the increased volume of business.

The **Lux Clock Manufacturing Company,** 97 Sperry street, Waterbury, Conn., is having preliminary plans prepared for the construction of a five-story factory unit. Estimated cost to exceed $100,000. This firm operates a plating department.

The **United States Electrical Tool Company, of Cincinnati,** Ohio, has opened a New England office at 514 Atlantic avenue, Boston Mass. Ralph E. Bell has been appointed district manager for New England and will have charge of this office.

Buckeye Soda Products Company, 32 Main street, Cincinnati, Ohio, has opened an office in Cleveland, where the same type of business will be conducted as in Cincinnati. The new offices are located at 1236-1240 and 1244 Engineers Bank Building.

The **Trane Company,** Second and Cameron streets, La Crosse, Wis., manufacturer of appliances, devices and materials for the steamfitting and plumbing trades, will invest about $45,000 in an addition, 78 x 115 ft., to be used as a stock room. R. F. Trane is general manager.

The **Uehling Instrument Company**, Paterson, N. J., has appointed the Ernest E. Lee Company, 115 South Dearborn street, Chicago, Ill., to represent it in Northern Illinois and Northern Indiana, in connection with the sales of CO_2 recorders, fuel waste meters and other power plant instruments.

The **American Equipment Company,** of Detroit, Mich., have taken on "U. S." electrical drills, grinders and polishers for Metropolitan Detroit. Mr. Goodson, president of this company, is especially well known to the executives of the automotive industries. They will handle no other make of electrical tools.

The **Coleman Lamp Company,** Queen and Davies streets, Toronto, Can., is building an addition to its plant. R. G. Kirby, 539 Yonge street, has the general contract. This firm operates the following departments: cutting-up shop, spinning, brazing, plating, japanning, stamping, tinning, soldering, polishing, lacquering.

The **Kuhlman Electric Company** of Bay City, Mich., has awarded a contract to the Henry G. Webber Construction Company for an addition to the Kuhlman factory. This addition will measure approximately 75 x 250 ft. In this new building the Kuhlman Company is preparing to build the larger sizes of transformers.

Krischer's Manufacturing Company, Inc., Brooklyn, N. Y., is erecting a three-story building, 100 x 165, which will cost $110,000, with all latest modern improvements. This factory is to increase their facilities in the line that they manufacture: trimmings for belts, suit cases, and other hardware. They expect to have the building ready by April 1, 1926.

The **Mt. Morris Valve Corporation,** Mt. Morris, N. Y., will engage in the manufacture of a complete line of brass valves for all purposes. They are now engaged in the construction of a plant at this point. The officers of the corporation are as follows: president, D. L. Bellinger; vice-president, Frank P. Conlon; secretary, A. R. Lawrence; treasurer, Frank E. VanDorn.

At the last meeting of the board of directors of the Linde **Air Products Company,** G. W. Mead, formerly president, was elected chairman of the board. W. F. Barrett, formerly vice-president, was elected to the presidency. In addition to these

changes R. R. Browning was elected vice-president in charge of sales activities, and J. A. Rafferty, vice-president in charge of engineering, manufacturing and research.

At a recent meeting of the board of directors of the **Prest-O-Lite Company, Inc.,** M. J. Carney, formerly president, was elected chairman of the board. William F. Barrett, formerly vice-president, was elected to the presidency. Ralph R. Browning was lected vice-president in charge of acetylene sales activities. R. J. Hoffman was re-elected vice-president in charge of storage battery and automotive divisions.

Driver-Harris Company, Harrison, N. J., manufacturer of electrical resistance wires and other wire products, has acquired the plant and business of the Electrical Alloy Company, Morristown, N. J., for $500,000. The plant will be continued as a division of the purchasing company. Frank L. Driver is chairman of the board. This firm operates the following departments: casting shop, rolling mill.

The **Indianapolis Plating Company,** 635 Kentucky avenue, Indianapolis, Ind., has plans for a new one-story factory at 425 West Vermont street, to cost approximately $45,000, of which about $25,000 will be expended for machinery. It is proposed to remove the present works to the new location. This firm operates the following departments: grinding room, galvanizing, plating, polishing, lacquering.

Mott Sand Blast Manufacturing Company, which formerly had its office at 24 South Clinton street, and operated three separate manufacturing plants in Chicago, Ill., has recently moved its office and all equipment into its new plant at 4611-4621 Flournoy street, Chicago. The new location provides 10,000 sq. ft. of floor space arranged and equipped specifically for the manufacture of sand blast equipment.

Announcement is made of the purchase of the **Crescent Silica Company** of Ottawa, Ill., by the Standard Silica Company of Ottawa and Chicago, manufacturers of Blackhawk brand molding sands. By this purchase the Standard acquires 82 acres of land in the heart of the Ottawa district, with a modern concrete and steel washing and drying plant, and other equipment. The capacity of Standard is doubled by this acquisition.

A Salesman's Convention of the International Nickel Company was held at rolling mills and refinery at Huntington, W. Va. It started October 12th and continued to October 15th. This meeting was attended by the officials and department heads of the International Nickel Company and the International Nickel Company of Canada, Ltd., together with all of the distributors in this country and Canada. At the meeting the 1925 activities were reviewed and plans for 1926 were discussed.

Cleveland Metal Products Company, Cleveland, Ohio, manufacturers of Perfection oil cook stoves, heaters and other widely known kerosene-burning household devices, has changed its name to Perfection Stove Company. The change is made for the purpose of connecting the company's name more closely in the public mind with the trade name "Perfection," under which the products of the company are marketed. There is no change in the organization or policies of the company. The following departments are operated: tool room, spinning, plating, japanning, stamping, tinning, soldering, polishing, lacquering.

At the Fourth National Exposition of Power and Mechanical Engineering at Grand Central Palace, New York City, November 30 to December 5, the **Botfield Refractories Company,** Philadelphia, Pa., exhibited in Booth 567, a number of examples of unusual fire brick construction laid up with Adamant Fire Brick Cement. In addition, interesting data on the service of Adamant-laid brickwork and original photographs of installations at well-known plants, were on display. Among the Botfield Refractories Company representatives in attendance will be L. B. Botfield, Axel H. Engstrom, C. C. Phillips, W. B. Smith, A. J. Wittwer and J. J. Sweeney.

NEW ANDERSON CHEMICAL PLANT

Following the acquisition of the Anderson Chemical Company, of Passaic, N. J., on December 24, 1924, by the Merrimac Chemical Company, of Boston, Mass., the former company announced this change of ownership. During the early part of 1925, it became apparent that a much larger plant was necessary. They, therefore, started construction of a new and up-to-date plant at Boston, where they will be able to operate far more efficiently than in their old location. This new plant was completed and ready for occupancy about December 5, 1925, and their manufacturing operations were transferred to the new location. All correspondence should be addressed to Anderson Chemical Company, 148 State street, Boston, Mass.

DISAGREEMENT ON ALUMINUM COMPANY

The Federal Trade Commission has disagreed within itself on a question about the Aluminum Company of America. The majority refused to submit to the Attorney General, data voluntarily furnished by the company. The minority state that this ruling is unsound.

NEW CHEMICAL ELEMENT

A new chemical element, which its discoverers call "Dvimagan" and have classified as No. 75 among the elements, was introduced to the Czech Academy of Sciences, November 16, 1925. Professor Jaroslav Heyrovsky, Professor of Physical Chemistry in the University of Prague, and his assistant, Professor Dolejsek, gave the demonstration.—New York Times.

BURNING WOODEN SHIPS FOR METAL

Stripped of their internal equipment and bound into a massive junk heap, thirty-one remnants of the wartime government fleet of wooden ships vanished in the flames of a salvager's torch November 7, 1925, on the Potomac River.

It is estimated that 300 tons of metal will be saved from each of the vessels by the Western Marine Salvage Company, which still has 209 of the wooden craft awaiting similar disposal.—New York Times.

STANDARDIZING GRINDING WHEELS

A general conference of manufacturers, distributers, and users of grinding wheels was held in Washington, D. C., under the auspices of the division of simplified practice, Bureau of Standards, on September 23, 1925. A reduction from 715,200 stock sizes to 255,800 was recommended and adopted by the conference. A report of the conference is now being circulated among members of the industry for acceptance. If accepted, this will be issued as a Recommendation in the Elimination of Waste Series.

OAKLEY CHEMICAL CONVENTION

Seventy busy men who take care of the cleaning needs of 18,000 manufacturing plants in many industries, met in New York, December 7 to 10. It will be the occasion of the Oakley Chemical Company's ninth annual conference on industrial cleaning, when its field service men from various parts of the United States and Canada come together in one big conference in the general offices of the company in New York, exchange ideas and experiences, and read and discuss technical papers on different phases of cleaning.

Because cleaning operations affect to a great extent, not only cost of production, but production from both quantity and quality standpoints as well, there has been a growing appreciation among manufacturers of the need of men thoroughly trained in this highly specialized subject, who can apply their technical knowledge to the cleaning and related problems of industry today.

Some idea of the extent of the program and variety of subjects covered may be gained by the fact that among the many papers that will be read at the conference, 16 are on technical subjects covering the petroleum, baking, textile, railroad, automotive, laundry, dairy, power plants, paper, and other industries.

December, 1925, will round out the 17th year of the Oakley Chemical Company's business life. From a small force of 3 men in 1909, it has grown into what is today one of the largest organizations in the filed of scientific cleaning.

SAMPLES OF HASNIUM RECEIVED

Two little pinches of white powder, sealed in tiny glass flasks, brought to the Bureau of Standards, Washington, D. C., and to American science today a message whose purport only time and patient research can disclose.

They were samples of the newly discovered element, hasnium, the gift of Dr. Neils Bohr, of Denmark. Scientists long have suspected that such a substance existed, but not until recently was a way found to extract it from other elements.

Hasnium is believed to be more plentiful than tin in the earth's crust. The uses to which it can be put are yet to be discovered.

CENSUS OF MANUFACTURES—1925

The Bureau of the Census is making plans for the next biennial census of manufactures, which will cover the year 1925, as provided in the Act of Congress approved March 3, 1919.

In deciding upon the items to be covered by the census, the bureau has consulted with the representatives of various manufacturers' associations with a view to securing, as far as practicable and without making the schedule too elaborate, information which will be of value to the representatives of the several industries concerned, and at the same time furnish a record of the progress of manufactures generally throughout the United States.

The blank forms upon which reports should be made will be mailed by the bureau to all manufacturers about January 1, and a report will be required from each manufacturer whose gross products are valued at $5,000 or more for the year 1925. It is to be hoped that every manufacturer concerned will have his records in such shape that he can fill out the schedule within a few days after its receipt, as the tabulation of each industry will not be made by the Bureau of the Census until reports are received from all manufacturers engaged in it. We therefore urge our readers to furnish this information, in case they are manufacturers, soon after January 1 in order that we may have, as early as possible in 1926, the statistics which will show the condition and record of their industry for the year 1925.

ALLOYS IN SAHARA TOMB

The skeleton of the personage buried in the reputed tomb of Tim Hinan, the legendary goddess and ancestress of the Tuaregs, was disinterred at Hoggar in the Sahara November 17, 1925, by members of the Franco-American Expedition, headed by Count Byron Khun de Prorok.

When the excavations had sufficiently advanced to give access to the royal body Dr. Chapuis clambered through the narrow opening of the tomb and began cautiously removing the mold covering the corpse. This contained scores of beads, carbuncles, garnets, objects of gold and silver, and two glass balls with black and yellow designs resembling eyes.

As the arms were uncovered they were the most striking spectacle in the tomb to meet the eye. Each arm was covered with massive bracelets, which shone dimly through the corrosion of the centuries and were decorated with heavy simple patterns and buckles and beads. There were seven on the left arm and eight on the right. After they were removed and polished the explores were puzzled to identify the metal. Seven were of a yellow substance which was thought at first to be gold and eight of a white substance resembling silver, but they did not have quite the correct ring and color, and were probably silver and gold alloyed with another metal, perhaps antimony. It is known that the Carthaginians extensively used antimony trickily, combining it with gold to increase the weight and the hardness. They obtained antimony from a secret source in Central Africa by caravans, probably passing down the winding river Tit past Tim Hinan's tomb to the Sudan. Hamilcar and Hannibal further weighted their gold with antimony when they paid their mercenaries in the fighting in Sicily.

If this theory is confirmed by an analysis of Tim Hinan's bracelets showing that they contain antimony it will be one of the most important links yet found between the ancient civilizations north and south of the Sahara.—New York Times.

HOOVER WANTS MORE RESEARCH

The United States lags behind other nations in fundamental scientific research, according to Secretary of Commerce Herbert Hoover, who spoke, December 1, 1925, at the annual meeting of the American Society of Mechanical Engineers at the Engineering Building, 29 West Thirty-ninth street. He said that we spend ten times as much on cosmetics as on research in pure science. "The Vital Need for Greater Financial Support for Pure Science Research," was the subject of the address by Mr. Hoover.

"It is, unfortunately, true," he said, "that we can claim no such rank in pure science research as that which we enjoy in the field of industrial research.

"Instead of leading all other countries in the advancement of fundamental scientific knowledge, the United States occupies a position far in the rear of the majority of European nations. A list of the awards of the Nobel prizes to men of various nationalities reveals the small proportion of first minds that we support. Other tests lead to the same conclusion, namely, that the number of first-rank investigators developed in the United States is far below what our population, education and wealth would lead one to expect."—New York Times.

ANACONDA BUYS GERMAN ZINC MINES

John D. Ryan, chairman of the Anaconda Copper Mining Company, confirmed advices from abroad to the effect that his company and W. A. Harriman & Company, Inc., had acquired an option to take over the zinc and coal mines of the Georg von Giesche, Heirs, Inc., which own the largest zinc mines in Europe and are also important coal producers in Germany. Financing of the new undertaking will be arranged by the Harriman interests, while Anaconda, it is understood, will operate the properties. The acquisition of the German mines, together with the American mines already owned, will give Anaconda control of between 16 and 17 per cent of the world's zinc production.—New York Times.

YALE & TOWNE BUY MILLER LOCK

The Yale & Towne Manufacturing Company announces that it has purchased all of the physical assets, good will, trade names and book accounts of Miller Lock Company of Philadelphia, Pa. The plant at Philadelphia will hereafter operate under the title of Miller Lock Works of the Yale & Towne Manufacturing Company. Arthur C. Jackson will continue in charge of the manufacturing operations with the title of Works Manager.

Edward S. Jackson will retire from the business at his own request, and the direction of sales and selling policy will be in charge of E. C. Waldvogel, vice president in charge of sales.

All orders and correspondence should be addressed to Miller Lock Works of the Yale & Towne Manufacturing Company, at Philadelphia, Pa.

This purchase had been made for the purpose of expanding the business of the Yale & Towne Manufacturing Company by adding to its lines new varieties of locks. It is hoped that the company may be favored with a continuance of the business heretofore enjoyed by Miller Lock Company.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America...	$ —	$ 58	$ 63
American Hardware Corporation....	25	105	106
Anaconda Copper	50	51⅝	51¾
Bristol Brass	25	5	8
International Nickel, com.........	25	40	40⅛
International Nickel, pfd..........	100	100	..
International Silver, com..........	100	—	235
International Silver, pfd...........	100	110	115
National Enameling & Stamping...	100	35½	37
National Lead Company, com.....	100	167	169
National Lead Company, pfd.....	100	116	117
New Jersey Zinc.................	100	195	199
Rome Brass & Copper............	100	130	143
Scovil Manufacturing Company....	..	228	238
Yale & Towne Mfg. Company, new	..	61½	65

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

DECEMBER 1, 1925.

Except for a reduction in the prices of brass and copper rods, sheets, tubes and wire which became effective on November 28, the condition in this branch of the metal business seems to be about the same as that which prevailed for several months. One mill reports that the output for November has exceeded anything that the mill has ever before accomplished even during the war years. There is no doubt that there are other mills in the industry of which this might also be said, for the reason that, as far as can be learned, the entire wartime capacity has been occupied and in full production in practically all of the brass and copper mills in the country.

Prices are quoted on a basis which is fairly satisfactory to the fabricators although there are still some items on which competition seems to be unnecessarily keen, and the margin of profit correspondingly low. The reduction of prices made on November 28 was simply a readjustment of schedules made necessary by the lower prices quoted for ingot copper.

In addition to the extreme activity in many lines which are heavy consumers of brass and copper material such as the automobile industry and the building trade, there has been a very definite increase in the demand for these items from the manufacture of various items going into household use, such as washing machines. It is reported that the washing machine industry is consuming more sheet copper than ever before in its history, due to the unprecedented demand for these machines, and the fact that practically all manufacturers of washing machines are running on a basis which has by far exceeded all previous records.

Many items similar to this could be mentioned to account for the unprecedented demand for the product of the brass and copper mills.

The development of the business in white metals consisting of the nickel and nickel-copper alloys is going forward at a rapid rate, and the mills producing these products all report a very satisfactory order book condition. The advertising campaign conducted during the year has covered a wide field with the result that these white metals have been applied to many industrial and commercial uses, as well as, in a large number of products for household use.

Many of the manufacturers of household equipment, such as automatic refrigerators, food containers and cooking utensils and items of a similar character, are adopting nickel and nickel alloys as the standard metals for their manufactured goods, and are conducting advertising campaigns in which this fact is featured. There are several new household dishwashing machines now appearing in the market, which are made of Monel metal. It is anticipated that there will be as large a demand for household dishwashing machines as there has been for clothes washers.

Several new installations of pure nickel dairy equipment have been reported during the month, and one of the largest milk pasteurizers ever constructed has been made of nickel. The advertising of the automatic refrigerator companies, manufacturing ice-cream cabinets and electric refrigerators for stores and homes indicates the adoption of white metal trim, and practically all of them are using Monel metal, pure nickel or nickel silver for this purpose. One of the largest manufacturers of meat slicing machines in the country has standardized on Monel metal for all parts in the meat slicing machine which come in contact with the meat.

Metal Market Review

Written for The Metal Industry by METAL MAN

DECEMBER 1, 1925.

COPPER

The copper market showed decided signs of relaxation in November. Prices recorded frequent declines, and the month ended with a net loss of fully ½c@⅝c per pound compared with the market level 30 days ago. Sales for domestic account were in fair volume, but export business fell off below normal dimensions.

Although domestic consumption continues on a large scale, production is more than keeping pace with the outlet according to the latest statistics. Stocks of surplus metal have increased recently, both here and abroad, which tends to keep the market irregular and easy. Domestic sales were made at 14¼c delivered. Conditions at the close are fairly steady on basis of 14¼c@14⅜c. Brass and copper products were reduced ¼c@½c a pound recently in keeping with the lower price of the raw material.

ZINC

Conditions were favorable to a high market level for zinc in November. Stability at present prices depends upon maintaining the same healthy relative state of supply and demand. With a paucity of nearby metal and good forward bookings, the market appears to be fairly favorable to producing interests. October deliveries were the largest for any month this year and stocks at beginning of November were the smallest this year. The strength of these influences is therefore apparent. The duration of present bullish conditions will depend upon the preservation of the existing balance between supply and demand and sound business conditions. The fact of outstanding importance is that present prices show a wide gap between the current rate 9.15c New York and average prices for the last seven years.

TIN

A continuation of extraordinarily high prices and the apparent confidence of powerful London operators in the prevalence of bullish factors are notable features in the tin situation. Undoubtedly the recent growing demand and the favorable statistics have given the bull party great opportunity to advance prices far above the normal level. The peak of the present movement was reached during the first half of November with Straits quoting 64½ cents. This was the highest price since 1920 and over 14 cents a pound higher than the average price in 1924.

It is significant that notwithstanding the advance in market values this year American tin deliveries for the first eleven months of 1925 were 70,295 tons, compared with 60,040 tons for the first eleven months of 1924, showing an increase of 10,255 tons. It appears likely, therefore, that consumers will be obliged to pay abnormally high prices for tin until there is a closer approach to supply and demand. Larger uses loom up for tin and the world's production is not increasing fast enough to prove a potent factor for bringing about a reactionary movement. However, the market is expected to be peculiarly sensitive for some time to come. Prompt and nearby Straits tin quotes 63¾c@64¼c at the November close. Future positions are fractionally below the spot quotation.

LEAD

At the beginning of November the leading producer advanced the price of lead from 9.50c to 9.75c New York basis. This level was maintained during the entire month and the excellent demand was sufficient to support the domestic position without serious change in the market trend. Renewal of Australian shipments to European consumers and the availability of Mexican bullion lead were not able to make any conspicuous impression on the local market. The extraordinary demand has maintained a scale of values tending to increase intensity of production. Despite this fact, however, market prices of lead have been abnormally high for the last three years. Foreign prices are under the control of speculative influences to a considerable extent. The American Smelting & Refining Company reduced its price of lead from 9.75c to 9.50c New York basis.

ALUMINUM

The advance in aluminum was a stimulating factor and brought consumers into the market for spot and future supplies. Orders were placed to run over first quarter of 1926 and in some cases for later shipments. Production and imports are readily absorbed, and domestic output is at a heavy rate. Virgin stock is firm at 29c for 99 per cent plus and 28c for 98-99 per cent metal. Remelted grades have also shared in the activity. Imported material was in good demand recently.

ANTIMONY

Notwithstanding the high price for antimony the supply of Chinese is on a limited scale and buyers are obliged to accept the situation as it is. Spot metal is held at 19⅝c duty paid and November-December shipment quotes 19c duty paid. Demand is in fair volume and consumers have covered requirements to a moderate extent. Output at Chinese sources is restricted and supplies are controlled with a view to keep market values steady.

QUICKSILVER

The movement in quicksilver has been more active lately and the market is firmer at $91 and upward per flask. Domestic demand is fairly good and the strength of all markets abroad is reflected in higher prices here.

PLATINUM

Buying has been on a fair scale and prices are firm at $116@$118 per ounce for refined platinum.

SILVER

Trading operations in silver bullion have been more active lately for China. India was interested on a moderate scale, and purchases for the Orient were in fair quantities. London and New York markets have fluctuated within rather narrow range according to the urgency of buying movements. Domestic sales to regular channels have been fair. Stocks are small and the situation is favorable to stability of market tone.

OLD METALS

Consumption of old metals continues in large volume. Weakness in the market for new copper, however, had a depressing effect on scrap copper and brass. Buyers are more cautious in taking in stock at present prices. Lead scraps hold up fairly well and zinc displays a firmer tone. Aluminum is specially firm, but dealers find it less profitable to handle owing to stiff prices ruling. Current quotations are 11¾c for heavy copper, 9½c@9¾c for light copper, 7c@7¼c for heavy brass, 9c@9¼c for new brass clippings, 8c@8¼c for heavy lead, and 23c@23½c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1924, 13.419—January, 1925, 15.125—February, 15.00—March, 14.375—April, 13.625—May, 13.625—June, 13.75—July, 14.25—August, 14.875—September, 14.875—October, 14.625—November, 14.75.

Brass Mill Zinc—Average for 1924, 7.10—January, 1925, 8.60—February, 8.00—March, 8.10—April, 7.60—May, 7.55—June, 7.55—July, 7.80—August, 8.10—September, 8.30—October, 8.90—November, 9.40.

Daily Metal Prices for the Month of November, 1925

Record of Daily, Highest, Lowest and Average

	2	*3	4	5	6	9	10	11	12	13	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	14.875	.....	14.875	14.875	14.875	14.875	14.875	14.875	14.875	14.875	14.75	14.75
Electrolytic	14.65	.....	14.70	14.70	14.70	14.70	14.70	14.60	14.60	14.60	14.55	14.50
Casting	14.00	.....	14.125	14.125	14.125	14.10	14.10	14.00	14.00	14.00	13.95	13.95
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	8.85	.....	8.90	8.90	8.90	8.85	8.80	8.80	8.60	8.50	8.50	8.50
Brass Special	8.95	.....	9.00	9.00	9.10	9.10	9.00	9.05	9.00	8.90	8.90	8.90
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	63.50	.....	62.75	63.125	62.875	62.125	62.375	62.625	64.50	64.25	64.00	63.50
Pig 99%	62.00	.....	61.375	61.75	61.50	60.75	61.25	61.50	63.00	63.00	62.875	62.50
Lead (f. o. b. St. L.) c/lb. Duty 2⅜c/lb.	9.80	.....	10.00	10.00	10.00	10.00	9.85	9.875	9.80	9.75	9.80	9.80
Aluminum c/lb. Duty 5c/lb.	29	.....	29	29	29	29	29	29	29	29	29	29
Nickel c/lb. Duty 3c/lb.												
Ingot	34	.....	34	34	34	34	34	34	34	34	34	34
Shot	35	.....	35	35	35	35	35	35	35	35	35	35
Electrolytic	38	.....	38	38	38	38	38	38	38	38	38	38
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	20.00	.....	20.00	20.00	20.00	20.00	20.00	19.75	19.50	19.50	19.50	19.75
Silver c/oz. Troy Duty Free	69.75	.....	69.625	69.125	69.375	69.50	69.50	69.125	69.50	69.25	68.625	68.75
Platinum $/oz. Troy Duty Free	118	.....	118	118	118	118	118	118	118	118	118	118

	18	19	20	23	24	25	*26	27	30	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	14.75	14.625	14.625	14.50	14.50	14.375	.....	14.375	14.375	14.875	14.375	14.711
Electrolytic	14.50	14.40	14.35	14.30	14.25	14.15	.....	14.15	14.15	14.70	14.15	14.487
Casting	13.95	13.875	13.85	13.80	13.75	13.65	.....	13.65	13.65	14.125	13.65	13.929
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	8.50	8.60	8.65	8.75	8.85	8.85	.....	8.80	8.80	8.90	8.50	8.732
Brass Special	9.00	9.00	9.00	9.00	9.00	9.00	.....	9.00	9.00	9.10	8.90	8.995
Tin (f. o. b. N. Y.) c/lb Duty Free												
Straits	63.75	63.50	63.50	63.375	62.50	62.75	.....	63.125	64.00	64.50	62.125	63.270
Pig 99%	62.75	62.50	62.50	62.50	61.50	61.75	.....	62.00	63.00	63.00	60.75	62.105
Lead (f. o. b. St. L.) c/lb. Duty 2⅜c/lb.	9.65	9.65	9.50	9.65	9.60	9.60	.....	9.60	9.50	10.00	9.50	9.759
Aluminum c/lb. Duty 5c/lb.	29	29	29	29	29	29	.....	29	29	29	29	29
Nickel c/lb. Duty 3c/lb.												
Ingot	34	34	34	34	34	34	.....	34	34	34	34	34
Shot	35	35	35	35	35	35	.....	35	35	35	35	35
Electrolytic	38	38	38	38	38	38	.....	38	38	38	38	38
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	19.75	20.00	20.00	20.00	19.75	19.75	.....	19.625	20.00	20.00	19.50	19.836
Silver c/oz. Troy Duty Free	68.875	69.125	69	69.25	69.25	69.25	.....	69.125	69.25	69.75	68.625	69.224
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	.....	118	118	118	118	118

*Holiday.

Metal Prices, December 7, 1925

Copper: Lake, 14.25. Electrolytic, 14.00. Casting, 13.50.
Zinc: Prime Western, 8.80. Brass Special, 8.95.
Tin: Straits, 63.50. Pig, 99%, 62.75.
Lead: 9.35. **Aluminum,** 29.00. **Antimony,** 20.25.

Nickel: Ingot, 34.00. Shot, 35.00. Electrolytic, 38.00. Pellets, cobalt free, 40.00.
Quicksilver, flask, 75 lbs., $91.00. Silver, oz., Troy, 69.25.
Platinum, oz., Troy, $118.00. **Gold,** oz., Troy, $20.67.

Metal Prices, December 7, 1925

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10¾to11¾
Brass Ingots, Red	11¾to12¾
Bronze Ingots	11¾to12¾
Bismuth	$3.30to$3.35
Cadmium	60
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.50to$2.60
Manganese Bronze Castings	23 to41
Manganese Bronze Ingots	13 to17
Manganese Bronze Forging	34 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	65 to75
Silicon Copper, 10% ......according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
12¼to12½	Heavy Cut Copper	13¼to13¾
12 to12¼	Copper Wire	13 to13½
10¼to10¾	Light Copper	11½to12
9¼to 9½	Heavy Machine Comp	10¾to11¼
8 to 8¼	Heavy Brass	9¼to 9½
7 to 7¼	Light Brass	8 to 8½
8 to 8½	No. 1 Yellow Brass Turnings	10 to10½
8¾to 9	No. 1 Comp. Turnings	10½to11
8½to 8¾	Heavy Lead	9¼to 9½
5 to 5¼	Zinc Scrap	6 to 6½
12 to13	Scrap Aluminum Turnings	15 to17
19 to20	Scrap Aluminum, cast alloyed	21 to22
23 to24	Scrap Aluminum, sheet (new)	25 to26½
38 to40	No. 1 Pewter	42 to44
12	Old Nickel anodes	14
18	Old Nickel	20

BRASS MATERIAL—MILL SHIPMENTS

In effect Nov. 28, 1925

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.19⅜	$0.20⅞	$0.22⅞
Wire	.19⅞	.21⅜	.23⅜
Rod	.17⅛	.21⅝	.23⅝
Brazed tubing	.27⅜	......	.32⅝
Open seam tubing	.27⅜	......	.32⅝
Angles and channels	.30⅜	......	.35⅝

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.20⅜	$0.21⅞	$0.23⅞
Wire	.20⅞	.22⅜	.24⅜
Rod	.18⅛	.22⅝	.24⅝
Brazed tubing	.28⅜	......	.33⅝
Open seam tubing	.28⅜	......	.33⅝
Angles and channels	.31⅜	......	.36⅝

SEAMLESS TUBING

Brass, 24c. to 25c. net base.
Copper, 24¾c. to 25¾c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21⅜c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19⅜c. net base
Muntz or Yellow Rectangular sheet other Sheathing	20⅜c. net base
Muntz or Yellow Metal Rod	17⅜c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21¾c. to 22¾c. net base
From stock	22¾c. to 23¾c. net base

BARE COPPER WIRE—CARLOAD LOTS

17c to 17¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21¼c. net base
100 lbs. to 200 lbs. in one order	21¾c. net base

ZINC SHEET

Duty, sheet, 15% — Cents per lb.

Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	12.00 net base
Casks, jobbers' price	13.25 net base
Open Casks, jobbers' price	13.75 to 14.00 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	27c.
15% "	28½c.
18% "	29½c.

Nickel Silver Wire and Rod

10% "	30c.
15% "	33½c.
18% "	36½c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	35
Cold Drawn Rods (base)	43
Hot Rolled Sheets (base)	42
Cold Rolled Sheets (base)	50

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs. 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 72 to 75c. per Troy ounce, depending upon quality.

Rolled sterling silver 69¼ to 71¼c.

NICKEL ANODES

95 to 92% purity	45c. per lb.
95 to 97% purity	47c. per lb.
99% plus	49c. per lb.

Supply Prices, December 7, 1925

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12–.16
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., Carboys	lb.	.06
Nitric, 42 deg., Carboys	lb.	.07
Sulphuric, 66 deg., Carboys	lb.	.02
Alcohol—		
Butyl	lb.	21.2–25.7
Denatured in bbls	gal.	.60–.62
Alum—		
Lump Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech, bbls	lb.	.03¼
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, kegs	lb.	.08
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), bbls	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.32
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, bbls	lb.	.17
Cyanide	lb.	.50
Sulphate, bbls	lb.	.05
Copperas (Iron Sulphate, bbl.)	lb.	.01½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.15
Nickel—		
Carbonate dry, bbls	lb.	.29
Chloride, bbls	lb.	.19
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.093
Potassium Bichromate, casks (crystals)	lb.	.08¾
Carbonate, 88-92%, casks	lb.	.06¼
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide (Fluctuating Price)	oz.	.70
Nitrate, 100 ounce lots	oz.	.49½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls	lb.	.04¼
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.43½
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.11
Chloride, casks	lb.	.07¾
Cyanide	lb.	.41
Sulphate, bbls.	lb.	.03⅛

COTTON BUFFS

Open buffs, per 100 sections (nominal),

12 inch, 20 ply, 64/68, unbleached sheeting			base,	$32.40-	$40.85
14 inch, 20 ply, 80/96,	"	"	base,	45.25-	50.80
12 inch, 20 ply, 80/96,	"	"	base,	47.35-	46.20
14 inch, 20 ply, 84/92,	"	"	base,	63.15-	62.25
12 inch, 20 ply, 88/96,	"	"	base.	....	63.25
14 inch, 20 ply, 88/96,	"	"	base,	....	85.15
12 inch, 20 ply, 80/96,	"	"	base,	....	52.70
14 inch, 20 ply, 80/96,	"	"	base,	....	70.80

Sewed Buffs, per lb., bleached or unbleached . base, .55 to .75